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ABSTRACT

The Science Communication Interest Group section of the proceedings contains the following 6 selected papers: "The Internet and the Environmental Protection Agency: Public Access to Toxic Chemical Off-Site Consequence Information" (James F. Carstens); "Motivations To Participate in Riparian Improvement Programs: Applying the Theory of Planned Behavior" (Julia B. Corbett); "Experts in All Areas: Medical and Scientific Sources in Stories about AIDS" (William P. Cassidy); "Get Excited! Be Calm! An Examination of Risk-Inducing and Risk-Reducing Statements in Food-Safety Messages" (Joye Gordon); "Media Effects on Public Understanding of Salmon Recovery: The Role of Information Processing" (Keith R. Stamm, Fiona Clark and Marcos Torres); and "A Repertoire Approach to Environmental Information Channels" (Garrett J. O'Keefe). (RS)

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The Internet and the Environmental Protection Agency: Public Access to Toxic Chemical Off-Site Consequence Information

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Abstract

The Environmental Protection Agency (EPA) and the Department of Justice published a final rule in August 2000 that regulates public access to information about possible dangers to pubic safety involving potentially toxic chemicals (Off-Site Consequence Analysis – OCA) used in manufacturing plants. Information about the potential severity of accidental chemical releases, including worse-case scenarios, is now only available on a limited basis, accessible through federal reading rooms, where citizens are required to show identification and are only allowed to take notes on ten OCA sites a month. These restrictions were imposed because law enforcement officials were concerned that OCA information could be used by criminals or terrorists to target manufacturing sites for attack.

This study reviews the risks and benefits assessments made by the EPA which formed the final rule, particularly those that affected how the OCA information would be disseminated. It is an important and unique ruling, in which the benefits of providing public citizens with information directly related to their health and welfare had to be weighed against the distinct possibility that the same information could compromise national security. The role of the Internet and its affect on the final ruling is discussed, along with how effective the reading room approach may be in meeting the requirements for information dissemination along with the need for restriction and security.

The Internet is not only changing the ways the public requests and receives government information; it is causing changes to the types of information available. Information posted on the Internet has a potential anonymous audience of millions, and becomes a valuable resource to increase public knowledge and dialogue. But once information is posted on the Internet, any control or restriction of access to the information is lost, and anyone may use the information in whatever way they choose.

The original Freedom of Information Act (FOIA) was signed by President Lyndon B. Johnson in 1966.[1] It was enacted to provide the public with access to records created by federal agencies.[2] "This legislation springs from one of our most essential principles: a democracy works best when the people have all the information that the security of the nation permits. No one should be able to pull curtains of secrecy around decisions which can be revealed without injury to the public interest." [3]

In 1995, the Paperwork Reduction Act requested the director of the Office of Management and Budget (OMB) to "foster greater sharing, dissemination, and access to public information."[4] President Clinton's 1995 Executive Order held federal agencies

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[1] Pub. L. No. 89-487, 80 Stat. 250 (1966) (as amended 5 U.S.C. 552 (Supp. 1997).
[2] There are nine exemptions to the type of information that has to be provided through FOIA requests, briefly listed here: a) Classified information about defense or foreign policy, b) Information about agency employee rules and practices, c) Information exempted by statue, d) Certain commercial or private financial information or trade secrets, e) Agency correspondence involved in deliberative process, f) Personal medical and employment files, g) Records used for enforcement, h) Information about regulation of financial institutions, i) Geological information about wells (oil).
[3] Statement by the President upon Signing Bill Revising Public Information Provisions of the Administrative Procedure Act, Weekly Comp. Pres. Doc 887, 895 (July 11, 1996).
[4] 44 U.S.C. 3501 et seq.

to be more responsible for disclosure of records.[5] This was an effort to improve public access.[6] In 1996, Clinton signed the Electronic Freedom of Information Act EFOIA.[7]

The EFOIA greatly increased the amount and type of information that could be requested and obtained. Instead of just paper documents, information contained in databases, word-processing documents, and electronic documents were reclassified as government "records" and are obtainable through EFOIA.[8] Instead of snail-mailing in a request and not knowing where or who was handling it, requests could be emailed in and tracked, and emailed multiple times if necessary. The intention was to allow public access to records so citizens would be aware of the data, information, assessments, and processes that are part of various rule-making and policy processes and encourage open discussion and debate about those processes and decisions.[9]

The FOIA and the EFOIA have had major effects on the amount and kind of information that the public obtains. These acts have also increased awareness of the power of collection, organization, and dissemination of that information through the Internet has and is causing major revisions in federal agency policy.

[5] (Exec. Order No. 12958 <http://www.cmcnyls.edu/public/USLaws/ExOrder.html).

[6] Although the FOIA was designed to provide a means for access to federal records, in many cases the actual function of the process was very limited. Government agencies handling FOIA requests returned request forms as incomplete, ignored them altogether, decided what information was "classified," returned documents with much information blacked out, or returned hundreds of pages that the requested information might be buried in. Combine these results with request-response waiting times of months or sometimes years, and the FOIA became likened to just another piece of ineffectual government bureaucracy. In June 1996, the FBI had a 4-year backlog in responding to requests. Martin E. Halstuk- *Bits, Bytes, and the Right to Know: How the EFOIA Holds the Key to Public Access to a Wealth of Useful Governmental Databases*. 15 Computer & High Tech. L.J. 73, 1999.

[7] Pub. L. No. 104-231, 110 Stat. 3048 (1996).

[8] Laura Gordon-Murnane. *The Electronic Freedom of Information Act: The Promise Remains Unfulfilled.* Searcher, Apr99, Vol. 7, Issue 4, p34.

9 *Id.*

The purpose of this paper is to show how one agency has reacted to the Internet and the EFOIA. The focus will be on the Environmental Protection Agency (EPA) and its recent final rule on public access to information about possible dangers to public safety involving potentially toxic chemicals used in manufacturing plants and factories (Off-site Consequence Analysis). This rule is important because it involves a unique set of circumstances that involve the right of the pubic to access important government-regulated health information, and how that information may also be a threat to community or national security because of terrorism activity. The study reviews the agency's decision-making process in allowing or restricting access to that information, especially in regards to the Internet and EFOIA.

Literature Review

This literature review examines scholarly discussions of Internet access to government regulatory information, implementation of EFOIA requirements by government agencies, and effects on the public's right to garner that information. The consensus among FOIA and EFOIA scholars and even involved government officials is that government agencies are not meeting the requirements as set forth.

Patrice McDermott, a policy analyst of the Office of Management and Budget (OMB) watch, said in a June 2000 Congressional hearing:

> I also want to note, because this is a hearing on the impact of technology on access, I want to note the public interest community is very concerned about recent and ongoing initiatives in the executive branch and in Congress to hollow out the scope of the FOIA by claiming, no credible evidence ever presented, that online access changes everything, and puts us all at terrible if unspecified risk.

> The very technology that promises more accountability is being raised as a specter to limit public knowledge about very real threats, risks, and vulnerabilities, most of which can and should be remedied.[10]

A major part of the problem is that there is no comprehensive policy on government agency Internet use. In an article on federal information policy, the following government-wide policies were listed as having a bearing on Web site development, and show how disparate and confusing the policies and operating procedures are:

- Executive Order 12862, Setting Customer Service Standards (1993),
- Government Performance and Results Act of 1993,
- Paperwork Reduction Act of 1995,
- Information Technology Management Reform Act of 1996,
- Rehabilitation Act of 1973, and
- Executive Order 13011, Federal Information Technology (1996).[11]

This lack of consistent policy has already resulted in the loss of electronic information and documents. Wendy R. Brown, in *Law Library Journal*, wrote that "no national program currently exists to uniformly obtain, preserve, and maintain continued access to electronic government data."[12] Brown also wrote that librarians have testified that valuable government documents that were accessible only on agency web sites have disappeared and become "fugitive documents."[13]

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[10] *House Committee on Government Reform: Subcommittee on Government Management, Information and Technology Holds Hearing on Electronic Freedom of Information Act*. U.S. Representative Stephen Horn (R-CA), Chairman. FDCH Political Transcripts, June (2000) [hereinafter *Hearing*].

[11] Bruce Smith, et al: *Federal Information Policy and Access to Web-Based Federal Information*. Journal of Academic Librarianship. July 2000, 26 (4) 274.

[12] Wendy R. Brown. *Federal Initiatives to Promote Access to Electronic Government Information: The Impact on the Federal Depository Library Program*. Law Library Journal, Spring 1999, Vol. 91, p291.

[13] *Government Printing Office and Executive Branch Information Dissemination: Hearings Before the Subcomm. On Government Management, Information, and Technology of the House Committee on Government Reform and Oversight*, 105th Cong. 107, 116 (1997) (statement of Prof. Robert L. Oakely, representing American Ass'n of Law Libraries and five other library organizations.)

The EFOIA sets forth three main requirements for federal agencies: the development of an agency electronic reading room with electronic access, creation of an EFOIA Reference Guide, and the publication of an Annual FOIA report. In 1998, the Office of Information and Policy (OIP) of the Department of Justice published10 basic recommendations for FOIA Web sites.[14]

The OIP recommended that FOIA information be accessible from the home page, that main home page item entries be clear, that the FOIA main page had the reference guide, privacy regulations, links to subsidiary agency components, annual reports, and have electronic access, among others. In an April 1999 article, Gordon-Murnane reviewed the Web sites of 15 federal departments and two component agencies to see how well they had fulfilled minimum EFOIA requirements using these recommendations. Her findings indicated that none of the agencies had "completely fulfilled all the requirements outlined in EFOIA" and that none had met the recommendations given by the Department of Justice (DOJ) and OIP, not even the DOJ, which did have one the best Web sites. The review also showed that 65-percent of all agencies do not have a FOIA link on their home page, and that most FOIA pages remain "hidden, incomplete, and difficult to access."[15]

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[14] OIP Guidance: Recommendations for FOIA Web Sites, FOIA Update, Vo. XIX, No. 3, Summer 1998) http://www.usdoj.gov/oip/foia_updates/Vol_XIX3/xi s3page3.htm.
[15] See Gordon-Murnane, *supra* note 8, at 34.

At the June 14, 2000, Congressional hearing, Ian Marquand, Freedom of Information chair for the Society of Professional Journalists (SPJ), cited a situation where data posted on an EPA site showed that Indiana has worse air pollution than Southern California. A check on the data showed that is was not posted with all the footnotes and qualifiers that would have shown that conclusion to be wrong. "EPA officials told us it is not their responsibility to make sure the data is read correctly, only that it appears." In fact the SPJ has submitted to Congressional record an FOI alert about the toxic chemical Off-site Consequence Analysis (OCA) worse-case scenario regulations at the EPA.[16]

One of the concerns about posting databases that use, in the business sense, largely proprietary information, such as that contained in OCA database, is the potential for industrial sabotage. While most of the chemical data would already be available or known to those within the industry, also considered is the "whistle-blowing" effect. One company may try to reveal or promote to the press the enormity of a competitor's worse-case scenario in order to gain a business advantage. One commentator of the proposed rule noted that when Risk Management Plans (RMP) reporting laws went into effect, many companies lessened their use or stocks of certain chemicals to avoid having to file RMPs. However, James T. O'Reilly notes in an article that as a result of the posting the Toxic Release Inventory (TRI) database by the EPA, the publication of the information has had a moderating effect on the disputes about industry trade secrets.

[16] See Hearing, *supra* note 10.

O'Reilly went on to write that the fear has lessened because "the select group of residents or neighbors who care about industrial emissions now seem to perceive that the 'secret' of pollution has been uncovered by the Toxic Release Inventory (TRI). Less fear from more disclosure is an ideal result for industry and regulators."[17]

Another point made by O'Reilly is that by the time the OCA legislation was passed in August of 1999, much of the worst-case scenario information had already been obtained and posted to the Internet by activists who considered the information more important to the public than concerns about industry secrets or increased terrorist activity.[18] It is interesting to note that in the risk assessment section in the final rule, the DOJ and EPA ruled the timeframe of the risk concerning terrorist activity was immediate upon posting, whereas benefits from public interest, media attention, and improved mitigation plans would take much longer.

Writing for the *Harvard Journal on Legislation*, U.S. Senator Richard Shelby (R-Ala.) noted that "transparency and accountability in government are two principles crucial to securing the public trust. Americans have the right to know how their tax dollars are spent and whether they are spent wisely, as well as the underlying scientific basis for many of our federal policies and rules."[19]

It is clear from the literature that government agencies are not meeting EFOIA requirements. Gordon-Murnane stated that "two striking features" were evident from her review of 15 agencies: a lack of consistency and a high level of duplication. She also recommends that one agency, the DOJ, post a FOIA Reference Guide, Handbook, and

[17] James T. O'Reilly. *Seeking a Truce in the Environmental Information Wars: Replacing Obsolete Secrecy Conflicts With New Forms of Sharing*. Environ. L.J. March 3, 2000. 30 10203.
[18] Pub. L. No. 106-40, 113 Stat. 207 (1999).
[19] Richard Shelby: *Accountability and Transparency: Public Access to Federally Funded Research Data*. Harvard Journal on Legislation. (37) Summer (2000).

sample letters, and just let all the other agencies link to that instead of each agency creating their own.[20] As use of the Internet grows and with the number of EFOIA requests, it will be imperative that government agencies fulfill related requirements. The EFOIA was intended to open public access to government agency information, but what remains to be seen if is government agencies are ready to be held accountable for this important task.

Research Questions and Methodology

As shown through the Toxic Release Inventory (TRI) database experience, dissemination of technical information about a public issue does produce public interest and discussion, initiates media involvement, and produce real results in business and industry that effect health and welfare concerns.

Questions to be answered include:

- Is the EPA justified in its decisions as to how to control and regulate public access to this information?
- Are EFOIA regulations being met by the EPA in regard to access to OCA information?
- In the EPA risks and benefits assessments, is fair weight given to potential benefits provided by increased public awareness and dialogue and media attention?

This paper will review how the EPA reacted to the Internet and EFOIA regulations concerning the recent final rule on Off-site Consequence Analysis (OCA),

[20] See Gordon Murnane, *supra* note 8, at 34.

part of the Chemical Safety Information, Site Security and Fuels Regulatory Relief Act (CSISSFRRA).[21] The proposed and final rulings will be examined, focusing on the benefits and risk assessment sections, to show the reasoning for the development of the reading-room procedures for information dissemination. Two other related EPA rulings will also be briefly reviewed, the Toxics Release Inventory (TRI)[22] and the proposed rule for National and Ambient Quality Standards (NAAQS).[23]

It is not within the scope of this paper to provide a detailed description of all the information that is provided in the proposed rule, final rule and related documentation used by the EPA in its assessments and conclusions. There are many topics involved that could be researched further – the role of security issues involving terrorist activity, the definition of a public agency, and government management of agency Web sites. The focus is on information used to determine information control and access decisions and methods, and weigh those against the right of public access.

Control and Access to EPA Records

The National Air and Ambient Quality Standards (NAAQS) rule was proposed by the EPA in 1997. It has not only generated controversy and litigation, but was also instrumental in getting changes in access to records. Currently, close to 75% of all federally funded research is done by non-government institutions, with universities receiving the majority of grants and awards.[24]

[21] Pub. L. 106-40 {subparagraph H, CAA 112r7).
[22] 42 U.S.C. §§ 11001-11050, ELR Stat. EPCRA § 3010330.
[23] Clean Air Act, 42 U.S.C. 7412(r) § 109.
[24] See Shelby, *supra* note 18, at 369.

This raises the question of what is considered to be a government agency and whether works created by a private institution, related to a government project, are subject to the same disclosure rules. Historically, this question has been based on two case decisions. In *United States v. Orleans*, a community action agency that was fully funded by the government was sued under the Federal Torts Claims Act.[25] The court ruled that because the agency was independently operated and not subject to the control of / or supervision of day-to-day operation by the government, the acts of the agency could not be considered acts of the government for purposes of the Torts Claims Act.

In *Forsham v. Harris*, petitioners requested data that was held by private physicians and scientists working under federal grants from the National Institute of Arthritis, Metabolism, and Digestive Diseases.[26] The court ruled that although NIAMDD had custody of documents and supervision responsibilities, because it did not run the day-to-day operations the information was not "agency records." The court further clarified its ruling by saying the federal agency status was not conferred by federal "regulatory authority necessary to assure compliance with the goals of the federal grant."[27]

In the (still) proposed NAAQS ruling, data about ozone and particulate matter pollution and related health effects were gathered and assessed by Harvard University and the American Cancer Society.[28] At a public hearing held by the Veterans Affairs and Housing and Urban Development in 1997, U.S. Senator Richard Shelby

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[25] 425 U.S. 807 1976, Craig D. Feiser. *Privatization and the Freedom of Information Act: An Analysis of Public Access to Private Entities under Federal Law*. 52 Fed. Comm. L.J. 21, 1999.
[26] *Id.* 445 U.S. 169 1985.
[27] *Id.*
[28] See Shelby, *supra* note 18, at 369 .

(R-Ala.) requested that the data be made public in view of the controversial proposal (costs of implementing new pollution restrictions in the proposal range from the EPA's estimate of $2.5 to $8.5 billion to the Council of Economic Advisors' estimate of $60 billon).[29]

Senator Shelby also stated that "no one within the EPA for the federal government had reviewed" the data, yet the EPA Administrator was telling Congress to try to get the data from Harvard and the American Cancer Society:

> My unsuccessful effort to gain access to the data supporting the EPA's controversial NAAQS rule reinforced my belief that greater access to research data is necessary to ensure both that the best science is being used to support our federal rules and policies, and that federally funded agencies and researchers feel a greater sense of accountability to the public.[30]

Shelby supported a provision in the Fiscal Year 1999 Treasury and General Government Appropriations bill (later incorporated in the Omnibus Appropriations bill) directing the OMB to make data produced under federal awards or grants subject to FOIA under Circular A-110. The bill was passed by the House and the Senate and the OMB issued its final revision to Circular A-110 in 1999.

But the revised NAAQS standards are far from being implemented. The Supreme Court agreed to hear a case that will determine the validity of the EPA's proposed

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[29] *Id.*
[30] *Id.*

standards. In the case, *American Trucking Association v. U.S. Environmental Protection Agency*,[31] the court's decision could have a wide ranging effect, including such issues as the "delegation of legislative power, the use of scientific and technical information, and application of cost-benefit analysis."[32] The Supreme Court just ruled (Feb. 27, 2001) that the EPA did not overstep their authority in setting standards for ozone and soot. Justice Scalia wrote that the Clean Air Act "unambiguously bars (industry) cost considerations" in setting air quality standards."[33] Clearly, this is one situation where the disclosure of data and information, to not only the public but also for review by the very government agency that requested it, resulted in a much more open, robust discussion of the proposed policy and helped define new legal parameters and regulations.

Off-Site Consequence Analysis (OCA)

On December 3, 1984, more than 40 tons of the lethal gas methyl isocyanate escaped from the Union Carbide factory in Bhopal, India. More than 8,000 people were killed within days of the accident and hundreds of thousands more were injured. Sixteen years later the number deaths attributed to the accident is more than 16,000 and still climbing.[34]

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[31] (ATA)175 F.3d 1027, on reg. 195 F.3d f (D.C. Cir. 1999), cert. Granted, 120 S. Ct. 2003 (May 22, 2000).
[32] Lewis Goldshore, Marsha Wolf. *Environmental Law Clean Air Act Under the Microscope: U.S. Supreme Court to Decide Challenge to EPA's Regulations on Ambient Air Quality*. N.J. L.J., Sept. 18, 2000).
[33] Whitman v. American Trucking Assoications, 99-1257, 529 U.S. 1129 (2000) and American Trucking Associations v. Whitman, 99-1426, 530 U.S. 1202 (2000).
[34] (http://www.corpwatch.org/bhopal/).

In response to that tragic accident, Congress enacted several pieces of legislation to try to prevent such a scenario from happening in the United States. Under new section 112(r) of the Clean Air Act (CAA),[35] industrial facilities handling dangerous chemicals were given responsibility (duty) to do so safely. The Environmental Protection Agency (EPA) was given responsibility to establish a regulatory program that made such facilities develop a Risk Management Plan (RMP) that included risk assessment and procedures for accidental release scenarios.

The section also directed such companies to file a summary of their RMPs with the EPA that included information about potential hazards to the public and worst-case scenarios,[36] and said that this information should be made available to the public.[37] Further actions included the issuing of a rule by the EPA in 1994 listing the most potentially hazardous toxic and flammable chemicals and a "threshold of concern" for each, and a ruling requiring all facilities on the "List rule" to develop and implement an accident prevention program.[38]

As of April 2000, more than 15,000 facilities have submitted Risk Management Plans to the EPA.[39] An integral part of an RMP is the Off-Site Consequence Analysis (OCA). The OCA contains a summary describing the consequences of accidental leaks from the facility and also includes a section that describes the hypothetical worst-case scenario and alternative scenarios for each potential leak possibility.

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[35] 42 U.S.C. 7412(r) (1994).
[36] 42 U.S.C. 7412(r) § 112r7Bii (1994).
[37] 42 U.S.C. 7412(r) § 112r7Biii (1994).
[38] Accidental Release Prevention Requirements; Risk Management Programs Under the Clean Air Section 112 (r)(7); Distribution of Off-Site Consequence Analysis Information; Proposed Rule. Fed. Reg., April 27, 2000. 40 CFR Chapter IV, 24833-24848.
[39] Chemical Accident Prevention Provisions 40 CFR § 68 (1994).

While the EPA was considering the possibility of publishing the RMPs on the Internet to meet public access requirements, the Federal Bureau of Investigation and other law agencies raised concerns that releasing such information would provide would-be terrorists or other criminal(s) with information that would allow them to target specific facilities for possible terrorist activity. These concerns led to the passage of the Chemical Safety, Site Security and Fuels Regulatory Relief Act (CSESSFRRA).[40] This gave the OCA section of RMPs exemption from the Freedom of Information Act for one year, and gives the President the responsibility to assess the dangers from providing the public with such information.[41]

EPA Off-Site Consequence Analysis Proposed Rule

A January 27, 2000 memorandum gave the Attorney General the responsibility to assess the risk of increased terrorist activity, and the Administrator of the EPA the responsibility to assess how public disclosure would increase incentives to reduce accidental release.[42] The proposed rule would be subject to review and approval by the Office of Management and Budget (OMB). The Proposed Rules were published in the Federal Register on April 27, 2000. The proposed rule would:

> Provide access by the members of the public and government officials to this information in ways that are designed to minimize the likelihood of accidental releases, the risk to national security associated with posting the information on the Internet, and the likelihood of harm to public health and welfare.[43]

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[40] Pub. L. 106-40 {subparagraph H, CAA 112r7).
[41] CAA § 1112r7hiii (1999).
[42] 65 Fed. Reg. 8631 (Feb. 22, 2000) (to be codified at 40 CFR Chpt. IV).
[43] 65 Fed. Reg. 82, 24833 (Feb. 22, 2000) (to be codified at 40 CFR Chpt. IV).

The risk assessment found that "an increased risk of terrorist or other criminal activity would accompany the release of certain items of Off-site Consequence Analysis (OCA) information via the Internet."[44] The assessment also found that such information could be used by terrorists to target specific sites to cause hazardous industrial chemical release. The benefits assessment found that public disclosure would "likely lead to a significant reduction in the number and severity of accidental chemical releases," and that it is important that such information be easily accessible to the public.[45]

To attempt to minimize the risks and maximize the benefits, the EPA proposed that each state set up a minimum of one "reading room," where citizens would have access to paper copies of OCA information. Each citizen would be restricted to obtaining information about no more than 10 sites a month and be able to take notes but not make copies of the OCA information. The EPA also proposed releasing less sensitive information on the Internet, and developing a "risk indicator" system which would indicate if a specific address was within the vulnerable zone of at least one facility that filed a Risk Management Plan (RMP).

A public hearing was held on May 9, 2000, and all comments on the proposed rule were due June 8, 2000. This meant that concerned parties were given 12 days to make plans to attend the hearing and about 40 days to compile and compose their comments. A total of 68 comments were submitted from groups representing industry, trade associations, law enforcement, environment groups, journalists, emergency response groups, the public, and other parties. The EPA's consideration of and response

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[44] 42 65 Fed. Reg. 82, 24837 (Feb. 22, 2000) (to be codified at 40 CFR Chpt. IV).
[45] *Id.* 24838.

to comments were then included in the publication of the final rule, which became regulatory law upon publication.

EPA Off-Site Consequence Analysis Final Rule

The final rule was published on August 4, 2000 in the Federal Register.[46] The final rule will be discussed here regarding the following main topics:

- Comments on Risk and Benefits Assessments
- Comments on Reading Rooms
- Vulnerable Zone Indicator System
- Internet Accessible OCA information.

Off-Site Consequence Analysis Benefits Assessment

One of the factors used in the assessment was the EPA's experience with the Toxic Release Inventory (TRI). In 1980s, Congress passed the Emergency Planning and Community Right-To-Know Act (EPCRA), which provided a channel for providing the public with data from required facilities (albeit very technical information).[47] Congress further amended the Act in 1986 with the Toxics Release Inventory, which established a list of chemicals that statistics from releasing facilities must report on annually.[48] Although the chemical industry claimed that such information was 'trade secrets' and confidential, the annual reporting has actually lessened fears about the release of trade secrets, and benefited the public immensely.[49]

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[46] 40 C.F.R. Chapter IV (2000) 48107-48133.
[47] 42 U.S.C. §§ 11001-11050, ELR Stat. EPCRA §3010330.
[48] Clean Air Act, 42 U.S.C. 7412(r) § 109.
[49] See O'Reilly, *supra* note 16 at 1025.

Facilities that reported high levels of pollution ("release") received press attention and have reduced release levels. Nationally, since 1988, reported Toxic Release Inventory (TRI) emissions have dropped 43 percent, even though in those 12 years the industrial production has increased 28 percent.[50] The final report noted that interest in the TRI data, whether in published reports, published TRI data by a company, or in negative press reports, was definitely a factor in reducing emissions. Also, the facilities identified as "worse polluting" in news reports significantly reduced their emissions compared to other facilities. Although there may be variances due to industry classifications, "these variations, however, would not effect the results of the assessment's comparative analysis of TRI emissions reduction rates for facilities that were subject to significant negative publicity and those that were not.[51] The rule further states that public information would lead to increased understanding and dialogue about chemical release and hazards, and that "resulting public pressure could lead to adoption of additional risk reduction measures."[52] The EPA also concluded, "We remain convinced that the assessment correctly concluded that readily available, easily accessible and interpreted (toxic chemical) OCA information, in combination with RMP information, would stimulate public dialogue about chemical risks and would result in at least some of the 15,000 facilities implementing additional risk reduction measures."[53]

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[50] 65 Fed. Reg. 82, 24837 (Feb. 22, 2000) (to be codified at 40 CFR Chpt. IV).
[51] 40 C.F.R. Chapter IV (2000) 48110.
[52] *Id.*
[53] *Id.*

While some companies do publish their own executive summaries that include Off-site Consequence Analysis (OCA) data, and some organizations have published "worst-case" scenarios for various sites and facilities, the information contained in the OCA and RMP reports is the most accurate for risk assessment.

Off-Site Consequence Analysis Risks Assessment

Several issues were raised by commentators that were not directly related to the main topic of the risk assessment – if posting OCA information on the Internet would increase criminally related chemical releases. One issue was whether a database of OCA information could be compiled using the notes-by-hand reading room access. The final report basically brushes aside this concern by concluding that it would take too much time and transcription to create such a large database, and that because it would not be official government information, it would not be considered as accurate or reliable. Other issues, such as using OCA information for industrial espionage, or locating chemicals that could be used for illicit drug manufacture, were not addressed.[54]

One of the main issues concerns whether or not publishing the OCA information on the Internet would actually lead to an increase in criminal or terrorist activity. The risk assessment concludes that it will because "OCA information would provide someone seeking to target or maximize an industrial chemical release with helpful information that is not currently available."[55]

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[54] *Id.* 48111.
[55] *Id.* 48111, 48112.

Several commentators noted that much of the OCA information was already available on the Internet through the Risk Management Plan (RMP) executive summaries. The risk assessment noted that while this is true, some information would very useful to terrorists, such as the population within the hazardous zone and effects on public and environmental receptors, is not available in an organized and accessible database like the OCA information.[56]

The risk assessment did note that much OCA information is available through the Emergency Planning and Community Right-To-Know Act (EPCRA), such information is only available by personal contact with a State- or Local-Emergency Response Commission, an action that most criminals or terrorists would avoid. Internet posting would allow anonymous access to information that includes data about the effects on population, chemical plume distance, and types of buildings and landmarks in the area.[57]

The risk assessment concludes that while public access to OCA information would result in a significant reduction in chemical risk, this benefit assessment is not as critical as the possibility of the use of the information by criminals or terrorists to achieve chemical release. Further, it will take more time to achieve any positive results via public pressure than it would for immediate action by criminals upon dissemination, and this concern validates restricting the manner and amount of public access on the Internet.

A related concern is that the benefits of reducing accidental releases, through public pressure, would result in real benefits in terms of casualties, property damages and evacuations, as opposed to the theoretical risks of criminal or terrorist activity. The

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[56] *Id.*
[57] *Id.*

assessment noted that two criminal plots to release chemicals in the United States were prevented by law enforcement, and that the trend for terrorist activities is increasing.[58]

The consequences of a targeted, intentional release are much more severe than from an accidental release, and these potential consequences over-rule the need for public dissemination. "The risk assessment found evidence that terrorists are increasingly interested in using weapons of mass destruction (WMD) and that chemical releases can be triggered from an industrial facility, thereby converting that facility into a WMD."[59]

Off-Site Consequence Analysis Reading Rooms

Under the Chemical Safety, Site Security and Fuels Regulatory Relief Act (CSISSFRAA), the government is required to provide the public with paper copies of (toxic chemical) Off-site Chemical Analysis (OCA) information in limited qualities,[60] and assess how to provide OCA information on the Internet.[61] It does not prevent companies from providing OCA information to the public, but it must maintain a list of those companies.[62] Also, CSISSFRAA prohibits mechanical and electronic copying of OCA information provided on paper copies, but is silent about copying by hand.[63]

To achieve these regulations, the EPA and DOJ are committed to establishing a network of federal reading rooms, with at least one in each state and more in states with high numbers of RMP facilities, such as Texas and California. It also encourages local

[58] *Id.* 48111, 48113.
[59] *Id,* 48111, 48114.
[60] CAA 42 U.S.C. 7412 § 112(r)(7)(H)(ii)(II)(aa).
[61] CAA 42 U.S.C. 7412 § 112(r)(7)(H)(ii)(II).
[62] CAA 42 U.S.C. 7412 § 112(r)(7)(H)(v)(III).
[63] CAA 42 U.S.C. 7412 § 112(r)(7)(H)(vii).

outlets, such as State Emergency Response Commissions (SECRs), Local Emergency Planning Committees (LEPCs) and fire departments to provide reading-only access to information about facilities in their jurisdiction.[64]

At the reading rooms, any person may obtain OCA information about a maximum of 10 facilities a month. That is, multiple visits are allowed, but information may only be obtained about 10 facilities each month, even if different reading rooms are used. The restriction to 10 facilities per month was determined by analyzing the geographic distribution of RMP facilities in the United States. It was shown that 82% of all counties that have RMP facilities have no more than 10 facilities. This would allow residents of those counties to view OCA data on all RMP facilities in one visit.[65]

The reading rooms will be open during normal business hours, and some will have OCA data on site. Others sites will require the requester to call a toll-free number three days prior, and provide the names of the facilities information is being requested about. At the reading room, the requester will have to show valid photo identification, sign-in, and certify that they have not received information on more than 10 facilities that month. Person requesting information at an LEPC will have to sign-in and provide proof that they live in the LEPC jurisdiction.[66]

While the final rule acknowledges that the identification and sign-in process may have a chilling effect on citizens' use of the reading rooms, it also states that this is the only way to accomplish the statutory requirement that individuals have access to a

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[64] 40 C.F.R. Chapter IV (2000) 48117.
[65] *Id.* 48117, 48118.
[66] *Id.*

limited number of copies, and that it will help prevent the likelihood that OCA information will obtained by those wanting it for criminal purposes.[67]

The final rule states that sign-in records will be protected under the Privacy Act and would be retained for three years.[68] Federal reading rooms will not create a sophisticated tracking system or index by names. Sign-in sheets will be arranged chronologically so a reading room representative will be able to review the sheets to check if individual requesters have requested information for more than the 10 allotted facilities per month.[69]

Off-Site Consequence Analysis Internet Access

Information about OCA is divided into three categories. The first category provides information about the effects of a chemical release on the community, including the possible severity of the consequences, population information, and a map about worse-case scenario release. The second category contains information about the chemicals involved, what could trigger a chemical release, and data about the time and amount of release, again with worse-case scenario information. The third category includes information about active and passive mitigation measures about accidental releases.[70]

The final rule states, in summary, that information will be posted to the Internet regarding the concentration and physical state of the chemical, flammable endpoint information, the statistical model used, atmospheric considerations, and active and passive mitigation systems considered.

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[67] *Id.* 48117, 48119.
[68] (5 USC 552a).
[69] 40 C.F.R. Chapter IV (2000) 48117, 48120.
[70] *Id.*, 48125.

Information not to be posted on the Internet includes the name of the chemical involved, the release scenario, the quantity of chemical, release rates and duration, information about distance to endpoint, including flammables, public and environmental receptors, and any maps or graphics used to illustrate a potential release scenario.[71]

Additional information available through mail, e-mail or telephone requests include information from the Vulnerable Zone Indicator System (VZIS), which will show if a specific address falls within any RMP facility's alternative or worse-case release scenario, and provide information for identifying those facilities and for obtaining more specific OCA information, either through RMP or the facility itself.[72]

Discussion and Conclusion

The EPA has met the EFOIA requirements in providing access to OCA information. Citizens can access information, on limited basis, about potential accidental chemical releases and how they might be affected. The procedures of the reading rooms may provide a chilling effect, but access is available. The potential for abuse of the information by criminal groups and its threat to community and national security was a concern that ultimately over-rode, understandably, concerns about ease and convenience of access.

The final rule by the EPA concerning OCA information is unique in that involves information that clearly concerns the public's health welfare in regard to accidental chemical release, and yet must also consider community and national security in regard to possible criminal and terrorist activity. In its assessments for risks and benefits, the EPA

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[71] *Id.* 48128.
[72] *Id.* 48127.

has obviously decided that the threat from terrorist activity has over-ruled concerns about meeting FOIA regulations, indeed, part of the uniqueness is because the threat is deemed greater if information is posted on the Internet.

As a government agency that could be held accountable for providing information that led to a terrorist attack, it is completely understandable for the EPA to rule on the side of caution. But an overall review of the risk assessment raises several important factors that should be considered, even if given the lack of hard data to consult. One factor is the amount of OCA information that is already available to the public. O'Reilly states that much of information that will be restricted to reading-room access only has already been compiled by activist groups and posted on the Internet.[73] The EPA acknowledges that much pertinent information is included in Risk Management Plan Executive Summaries and these too are available already on the Internet. And the reading-room access provides a mean for any person with "proper" identification to obtain specific OCA information, including worse-case scenario.

To play devil's advocate for a moment, take the point of view of a terrorist group. If a criminal group were planning to commit an act of chemical release terrorism in the United States, how hard would it be to get the necessary information? A skilled researcher would be able to access all the RMP summaries and OCA information already posted on the Internet. Also consider that the terrorist group would presumably have one member knowledgeable about chemical manufacturing processes and related security and safety plans. To go a little further out on the limb, how hard would it be for a member (or supporter) of the terrorist group to obtain specific information through the reading room?

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[73] See O'Reilly, *supra* note 16.

With all due respect to law enforcement groups, it is not hard for anyone with criminal connections to obtain perfectly valid but false identification, surely valid enough to pass cursory inspection at an EPA reading room. These do not seem to be extreme assumptions, and raise the question of the effectiveness of the EPA reading-room procedure.

The lawsuit brought against the EPA by the American Trucking Association raises another consideration.[74] One of the issues the lawsuit raises is application of cost-benefit analysis into the setting of the NAAQS standards. The lawsuit questioned how the EPA can set pollution standards without considering how much industry will have to pay to meet them. The Circuit Court (over-ruled) agreed, stating "It (EPA) has failed to state intelligibly how much (pollution) is too much."[75] The issue is how much is industry responsible (i.e., how much will it cost) for providing for public health and welfare.

The same issue could be applied to the OCA information. As seen with the TRI database experience, once the public became informed and media attention focused on high-polluting facilities, those facilities reduced their levels of pollution, meaning the industry took responsibility. If the same public awareness and media attention were paid to OCA information, of the 15,000 facilities now reporting RMPs, those most at risk would receive negative publicity. This could lead to an increased industry responsibility for improved security and safety plans, thus not only reducing the possibility of successful criminal activity, but also increasing the safety for public health and welfare.

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[74] (ATA)175 F.3d 1027, on reg. 195 F.3d f (D.C. Cir. 1999), cert. Granted, 120 S. Ct. 2003 (May 22, 2000).

[75] Lewis Goldshore and Marsha Wolf. *Environmental Law Clean Air Act Under the Microscope: U.S. Supreme Court to Decide Challenge to EPA's Regulations on Ambient Air Quality*. N.J.L.J. Sept. 18, 2000).

The EPA cited timeline concerns, i.e., the threat from Internet posting would be immediate for increased terrorist activity versus a longer time for positive effects from increased public dialogue. This assessment may prove to be correct if there is terrorist activity in the near future, and may weaken if there is none. Part of this consideration is the chilling effect that the procedures of final rule will have on private citizens. In the TRI situation, it was not until the posted EPA data was reformatted and made easily understandable by the Environmental Defense Fund group that it started generating increased public interest and media attention.[76] It is doubtful if individual citizens are even aware of the OCA information at this point, and it will be extremely difficult for an activist group to compile and post the information.

In conclusion, the final rule would seem to an example of an agency's 20-century solution to a 21st-century dilemma – how to control sensitive but possibly dangerous information that the public has the right to know? The EPA has met the requirement to allow access to paper copies to limited amounts of information. It has decided, justifiably, to use caution as threats from terrorism increase in the world and the United States. From practical and ethical standpoints, these seem to be logical steps. In the end, the dilemma will probably resolve itself – over time, a group will gather and format increasing amounts of OCA information and post it to the Internet, until it is complete and accurate enough that the EPA will close the reading rooms and maintain the information online. A terrorist event would probably result in two scenarios – the immediate classification of such information as secret, yet create a public demand for information about the security and safety of such facilities that could result in new access and new policies.

[76] http://scorecard.org

RUNNING HEAD: riparian participation

Motivations to Participate in Riparian Improvement Programs: Applying the Theory of Planned Behavior

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Motivations to Participate in Riparian Improvement Programs: Applying the Theory of Planned Behavior

Abstract

This study utilized the theory of planned behavior, a model of attitudinal factors related to behavioral intention, to investigate the lack of participation in government-sponsored programs to conserve riparian areas. A telephone survey of 209 rural landowners whose property abutted a waterway revealed that financial motivations, past behaviors, exposure to government information, and self-efficacy predicted 29% of the variance in intent to participate in future conservation programs. The findings suggest that financial variables are important moderators of perceived behavioral control.

Waterways in the arid West are valuable ribbons of public real estate. When these waters flow through privately owned land, they provide great benefit to the landowner, often in the form of water for livestock or crops. However, heavy use of the riparian zone – the interface area between the waterway and land – can collapse streambanks, increase erosion and flooding, send sediment and chemicals into the waterway, increase stream temperatures, and destroy fish and wildlife habitat. Two government agencies have programs to improve the quality of riparian areas, but participation by private landowners has been very poor. Like many communicators, representatives from the agencies would benefit from understanding the attitude and knowledge factors related to the lack of participation.

A theoretical model used frequently to identify attitudinal factors related to behavior is the theory of planned behavior (Ajzen, 1991). The model has been successful in predicting a variety of health-related behavior changes, including exercise, smoking, diet, cancer screening, alcohol consumption, and AIDS prevention (Brenes, Strube, & Storandt, 1998; Hu & Lanese, 1998; Armitage & Conner, 1999; Sheeran & Orbell, 2000; Conner, Warren, & Close, 1999; Smith & Stasson, 2000). The model also has been used increasingly to predict various environmental

behaviors, such as recycling, anti-nuclear activism, and water conservation (Cheung, Chan, & Wong, 1999; Boldero, 1995; Chan, 1998; Fox-Cardamone, Hinkle, & Hogue, 2000; Lam, 1999; Trumbo & O'Keefe, 2000). The TPB has warranted special journal issues and received worldwide empirical testing, resulting in meta-analyses (Sutton, 1998) and attempts to expand the theory by incorporating additional independent variables (Conner & Armitage, 1998), including media and information variables (Trumbo & O'Keefe, 2000; Griffin, Dunwoody, & Neuwirth, 1998).

With decades of theoretical refinement and testing, the theory has been successful in predicting behavior in a variety of contexts and with increasing specificity. Therefore, the objective of this study was to test the utility of the TPB in this applied research problem.

Background

Properly vegetated land adjacent to streams and rivers (called riparian areas) is critical for wildlife habitat, fisheries, and water quality. In Utah, a significant portion of riparian area land is in the care of rural private landowners, and a significant portion of that land is degraded and in need of rehabilitation and restoration (Nichols, 2000). Although there are several government conservation programs to help landowners make improvements to riparian areas, few landowners in the state have participated.

The Utah Association of Conservation Districts represents 39 soil conservation districts in the state, districts that are local units of government responsible for soil and water conservation work in their areas. Each district works to increase voluntary conservation practices among farmers, ranchers, and other land users. The Natural Resources Conservation Service, a federal

agency formerly called the Soil Conservation Service, works with landowners to voluntarily protect and enhance soil, water, and other resources. With money from federally funded programs, NRCS provides financial and technical assistance to private landowners for on-the-ground conservation practices. Requirements for the various programs differ, but key provisions include cost-share arrangements for materials and installation and per-acre rental payments. Typical actions under these program include fencing, planting vegetation for long-term cover, and installing erosion control devices.

Theoretical Framework

The relationship between attitudes and behaviors has been of interest to scholars for decades. In the 1960s, Fishbein (1967) investigated the psychological processes by which attitudes cause behavior. In the 1970s, Fishbein and Ajzen (1975) developed the theory of reasoned action, a parsimonious model which held that a person's intent to behave in a certain way was largely a function of the person's attitude toward the act (his or her positive or negative evaluation of performing the behavior) and social norms (the person's perception of social pressures to perform or conform to the behavior). The theory also suggests that a person's intention to perform a behavior is strongly related to the behavior itself, if both are measured at the same level of specificity and within a short time frame.

Because the theory of reasoned action treats behavior as solely under the control of intention, it is most appropriately restricted to volitional behavior (Conner & Armitage, 1998) and may poorly predict behaviors requiring skills or resources outside an individual's control (Fishbein, 1993). Hence, the theory of planned behavior (TPB) extends the theory of reasoned

action by incorporating a third independent variable, perceived behavioral control, or the extent to which performing the behavior is considered to be easy or difficult. Both internal and external control factors can be relevant to behavior. For example, an internal factor may be inadequate knowledge of how to conserve water or where to take recycling. External factors may be barriers or constraints to performing the behavior that lie outside the control of the individual, such as the cost of mammography screening. The TPB maintains that the greater the perceived control one has over a behavior, the stronger the person's intention to perform that behavior.

Scholars have suggested that numerous additional independent variables be included in the TPB to better account for the range of conditions and contexts in research settings. As Ajzen noted, "the theory is, in principle, open to the inclusion of additional predictors if it can be shown that they capture a significant proportion of the variance in intention or behavior after the theory's current variables have been taken into account" (1991, p. 199). Conner and Armitage argued that "a theoretical description of the role of additional variables...is required if a theoretically coherent model is to result" (1998, p. 1433). In this study, an argument can be made to test the additional variables of past behavior, moral norms, self-efficacy, information variables, and financial factors linked to behavioral control.

Although past behavior does not cause subsequent behavior, frequent or repeated performance may help turn the behavior into a habit. Several studies have concluded that for habitual acts such as recycling, past recycling may play a dominant role in predicting subsequent behavior (Boldero, 1995; Chan, 1998; Cheung, Chan, & Wong, 1999). Others have argued that when a behavior becomes habitual, a person may be more likely to use simplified decision rules and to use the past behavior almost as a source of information (Verplanken, Aarts & van

Knippenberg 1997); information possessed because of past behavior is then capable of being automatically activated by the context in which the behavior occurs (Bargh, 1990). In this research setting, if landowners have taken past actions to protect their riparian area, whether individually or through a sponsored program, it should provide a valuable indication of commitment to protect the area and is a likely predictor of future protection.

People intend to engage in behaviors for which they possess self-efficacy or feel they are capable. Some researchers have separated self-efficacy from perceived behavioral control because of the latter's focus on beliefs about control (internal or external) and the former's focus on beliefs about capabilities (Dzewaltowski, Noble, & Shaw, 1990; Terry & O'Leary, 1995; Armitage, 1997).

Moral norms are a person's perception of the moral correctness or incorrectness of performing a behavior or having personal feelings of a responsibility to perform (Ajzen, 1991). Moral norms provide an imperative beyond social values and have been found to affect intention (Conner & Armitage, 1998). Harland, Staats, and Wilke (1999) tested "personal norms" as an additional independent variable, a conceptualization that combined environmental values and moral norms, and found that its addition increased predicted variance. It is reasonable to assume that some landowners may feel moral responsibilities toward environmental behaviors that go beyond social pressures applied by neighbors and friends.

Some researchers have argued for the addition of information variables such as the degree of information seeking, information processing, or exposure to information. Griffin, Dunwoody, & Neuwirth, (1999) proposed that information processing factors be incorporated into behavioral models such as the TPB. Trumbo & O'Keefe (2000) found that information effects (information

seeking, exposure, and attention) were strong predictors of both attitudes and norms, and all three variables co-varied to predict intention to conserve water. Chan (1998) argued that mass media information was a major source of influence in the establishment of social norms.

Finally, past research has noted the importance of financial capability as an aspect of behavioral control for farmers' intentions toward water-saving technology (Lynne, Casey, Hodges, & Rahmani, 1995). Because the government-sponsored riparian programs involve some cost-sharing measures, financial capability and financial motivations may prove important predictors of behavioral intention.

Research Objectives

The objective of this study was to test the application of the TPB on a specific target audience (Utah rural landowners whose property abuts waterways) and a specific behavioral intention (participation in a government-sponsored riparian program). Like some past research that tested the TPB, this study did not measure actual behavior at a later date; low participation is the problem the agencies currently face and hope to ameliorate with an information campaign.

In addition to testing for the standard variables of the TPB (attitude toward act, social norms, perceived behavioral control, and behavioral intention), this study tested for additional variables judged pertinent to the audience and context here: environmental attitudes, moral norms, self-efficacy, knowledge, information seeking and exposure, past behaviors, and cost and financial motivation factors.

Based on the literature and on the particular research setting, this study poses one primary research question: Which of the independent variables of the TPB best predict intention to

participate in a government-sponsored riparian program? This is phrased as a question rather than a hypothesis for several reasons. First, this was an applied research project that would enable the clients to develop an information campaign based on the best predictors of intention to participate. As Sutton (1998) carefully explained, "If the main aim [for utilizing TPB variables] is to develop a predictive model, we do not need to concern ourselves...with specifying causal processes" (p. 1319). Sutton acknowledged that while the TPB can be considered a causal model when used with path diagrams or mathematical equations, researchers may at times want to maximize predictive power in order to better target interventions.

Second, much of the past research utilizing the TPB for environmental behaviors involves widely defined or generalized behavior, such as recycling, water conservation, or leisure choices (Ajzen & Driver, 1992). The target behavior here is both narrowly defined and, although voluntary, represents a monetary and more significant commitment.

Third, the target population is rural. As demonstrated by numerous researchers, rural homogeneous communities differ significantly from their heterogeneous urban counterparts in the way that information and conflicts are processed and decisions made (Olien, Donohue, & Tichenor, 1995; Hindman, 1996; Corbett, 1992). Past research utilizing the TPB for environmental behaviors has tended to rely on urban samples (Chan, 1998; Boldero, 1995), communities of varying size (Trumbo & O'Keefe, 2000), or the ubiquitous sample of college students (Cheung, Chan, & Wong, 1999; Azjen & Driver, 1992). It may be that particular variables, such as environmental attitudes or social norms, play different roles in rural areas where the majority of landowners are involved with natural resources on a daily basis. In addition, riparian areas are a unique interface between private property and a "public" waterway, which

may influence the perceived behavioral control of rural landowners over their property.

Method

This research was conducted as part of a senior-level communication research course that was taught as "service learning," a pedagogy designed to link classroom learning with the research needs of community and regional non-profit organizations (Corbett & Kendall, 1999). A telephone survey was considered an efficient method of gathering the data, considering the limited time frame of the semester and the course objective to train students in a variety of research techniques, such as interviewing.

The target population was individual landowners whose private property adjoined a river, stream, or natural waterway and who would therefore be eligible to participate in a government-sponsored riparian improvement program. Because many waterways are surrounded by state or federal land, focus was given to watersheds containing significant amounts of private land. Construction of the sampling frame was coordinated by the Utah Association of Conservation Districts. They contacted field agents with a variety of state and federal resource agencies and a university extension service to obtain copies of appropriate mailing lists and databases. All collected names with complete addresses and phone numbers were used; no sampling was performed. The compiled list could be considered a census of private landowners along many watersheds, particularly in the northern and central parts of the state.

The survey instrument consisted of 53 questions, designed to test numerous variables linked to the theory of planned behavior, as well as to elicit information valuable to the agencies. Representatives from each agency reviewed the survey for accuracy and provided phone numbers

of several individuals (who lived in a watershed that was not sampled) who could be interviewed as a pre-test for comprehension and length of the survey instrument.

Measurement

Table 1 lists variables of the TPB and their operationalization. Because of the time constraints of telephone interviewing and the additional information needed by the agencies, several independent variables were treated as univariate measures: attitude toward act, self-efficacy, moral norm, and intention.

Both social norms and perceived behavioral control were measured with two questions. Social norms was operationalized both as a general question regarding land practices and as a question specific to water resources. Past research has noted that perceived behavioral control (PBC) can come from inner or personal constraints as well as external ones (Conner & Armitage, 1998). In this study, one question asked the degree of perceived personal control over private land management, and a second question tapped government involvement in private land management, a genuine concern in a state with over 60% of the land owned by the state and federal governments.

Researchers who have studied environmental behavior have often included measures of environmental values in models of behavioral intention (Grob, 1995; Trumbo & O'Keefe, 2000). In addition, Beedell and Rehman (2000) found that British farmers with greater environmental awareness were more affected by conservation-related concerns and less by farm management concerns. Here, environmental values were measured with two frequently used questions drawn from previous surveys instruments regarding the balance of nature and economic growth versus environmental quality (Dunlap & Van Liere, 1978; Scott & Willits, 1994), and with a third

question that has been used for decades in the General Social Survey as a general indicator of environmental concern regarding the amount of money spent to protect the environment (Jones & Dunlap, 1992). Although there were significant correlations between these measures, scale reliability was insufficient to combine these three measures so the three were entered separately into the model.[1]

Other researchers have argued for measures of knowledge concerning desired environmental behavior, concluding that the more people know about their environment, the more appropriately they will behave (Grob, 1995). We asked six questions to test knowledge of the value of riparian areas; these measures were combined into a single scale (alpha reliability coefficient = .79).

Several studies employing the TPB have argued that current behavior is influenced by habit and repetition of past behaviors (Eagly & Chaiken, 1993; Boldero, 1995; Cheung, Chan, & Wong, 1999). In the context of this study, past actions taken to protect the riparian area on one's property could be strong indicators of future behavior. Meaningful past behavior could include past participation in a government-sponsored riparian program (of which there are several), as well as past actions taken independently to care for the riparian area, such as planting vegetation (not meant for livestock) and fencing. Although some of these items were significantly correlated,

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[1] Because these measures of environmental attitudes are well-established in prior research, the lack of scale reliability here is puzzling. Perhaps the demographics of the respondents (rural farmers and ranchers) affected their responses. For example, this sample was older, predominantly male, and with a lower economic status than the general population, and two of the three questions concerned money and the environment.

scale reliability was insufficient to combine these measures of past action.[2]

Information exposure was measured by asking how much information about riparian areas the respondent had seen or heard lately from the media, friends and neighbors, and the government ("absolutely none"=1 to "a great deal"=5). Information seeking was measured by asking, "How much effort would you say you've made in the last 12 months to look for information on caring for the riparian land on your property?" ("absolutely none"=1 to "a great deal"=5). Scale reliability was once again insufficient to combine these measures.[3]

Finally, because background information provided by the agencies suggested possible barriers to participation in riparian programs, we designed questions to tap obstacles and motivations to participation. We asked an open-ended question regarding the biggest obstacle to participation and a Likert-type question regarding cost as a factor in land management decisions. We also included a series of four questions regarding the importance of several motivating factors for participation: rental payments, cost-sharing, installation assistance, and supply of vegetation. These four financial motivational measures were combined into a single scale (alpha reliability coefficient = .68).

Data Collection

A letter on university letterhead was sent to all individuals on the list 10 days prior to

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[2] One reason for the lack of scale reliability may be that these three measures of past action (past participation, fencing, and planting vegetation) represent different levels of commitment by the landowner and were interpreted differently.

[3] This is not surprising. During the study period, riparian zones were not the focus of any information campaigns or newsworthy tie-ins (such as spring flooding, drought, or announcements such as proposed listing of endangered riparian plants and animals) that would have made the topic "on the lips" of neighbors and mass media.

telephone interviewing. The letter alerted the individual of the purpose of the study and of the upcoming phone call from a university student to conduct the survey. The letter also ensured voluntary participation, confidentiality, and anonymity of individual responses. Returned letters with incorrect addresses were deleted from the sample, leaving a call list of 352.

Three entire class periods were devoted to student interviewer training, including strategies, protocol, and feedback from agency representatives. In addition, mock situations with types of callers (such as quiet, opinionated, and individualistic respondents) and complete one-on-one interviews (in student pairs) were conducted.

Actual interviewing took place during a 10-day period; four call attempts (at different times of the day to accommodate outdoor work schedules) were made before an individual was considered unreachable. The survey took an average of 15-20 minutes to complete. The response rate was 59% (209 completed surveys, 44 refusals, and 99 unreachable).

Results

Descriptives

The survey respondents were overwhelmingly male (88%), and like the farming and ranching profession nationwide, were older. The mean age was 57 and ranged from 26 to 99. Education varied widely with 41% receiving a high school diploma or less, yet 26% finishing college or a post-graduate degree. Thirty-two percent reported an income of less than $30,000 a year, and about half earned between $30,000 and $60,000. The average number of acres owned was 293 and ranged from 1 to over 10,000. Primary land use was agricultural; 94% were engaged in farming, agriculture, ranching, livestock or combinations of them.

Most respondents (81%) believed that the best use for the riparian area on their property was its current use in agriculture, ranching, or farming. Respondents also believed the riparian area to be in good shape; 84% reported it in either excellent or good condition (which is a contrary assessment than that provided by the agencies).

Correlations

Table 2 shows correlations between the variables tested as part of the TPB. There were very few significant correlations of intent with TPB variables; unrelated to intent were attitude toward the act (protecting water resources), internal and external PBC, moral norm, general social norm, and two measures of environmental values. Significant but small correlations were found between intent and the social norm regarding water (.16), self-efficacy (.16), information seeking (.19), and the environmental value regarding the balance of nature (.18).

All three measures of past behavior had significant negative correlations with intent, the strongest being with past participation (-.34) and fencing (-.25). Obviously, many respondents believed that if they had taken these actions in the past (whether individually or as part of a program), they were not inclined to participate in future riparian conservation programs.

The strongest positive correlations with intent were for financial motivations (.41), exposure to government information (.33), and knowledge of riparian values (.22).

Although the environmental values measures were not suitable for scaling, some of them were significantly, moderately correlated with each other. In addition, some environmental values were significantly correlated with other related measures, including attitude toward the act (protecting water resources), the moral responsibility of protecting resources for future generations, and social norms regarding water. Knowledge of riparian values was significantly

correlated with most environmental values, as well as with motivations, information seeking, exposure to government information, attitude toward the act, and external PBC.

It is apparent from the correlations that some of the typical variables used in the TPB are either unrelated or only slightly related to behavioral intention.

Regressions

First, this was an applied research project that would enable the clients to develop an information campaign based on the best predictors of intention to participate. As Sutton (1998) carefully explained, "If the main aim [for utilizing TPB variables] is to develop a predictive model, we do not need to concern ourselves...with specifying causal processes" (p. 1319). Sutton acknowledged that while the TPB can be considered a causal model when used with path diagrams or mathematical equations, researchers may at times want to maximize predictive power in order to better target interventions.

As noted in the theoretical framework, we were most interested in maximizing predictive power (not establishing causal paths) in order for the client to better target their information campaign. Therefore, variables were entered simultaneously in the regression with the "enter" method, allowing the SPSS program to determine the contribution (if any) of each independent variable in predicting the dependent variable.

In the first step of the analysis, a regression was run with the parsimonious variables of the earlier theory of reasoned action: attitude toward act, social norms, and intention. The results were not significant (R^2=.03, $p>.05$).

In the next step, all variables of the TPB were entered into a regression model. As shown in Table 3, 23% of the variance was explained. However, only four variables contributed

significantly to the model: social norm-water, past fencing, past participation, and government information exposure. (Similar results were obtained, incidentally, when the regression was rerun with a stepwise procedure; all but these same four variables were excluded from the model and the R^2 value decreased to 21%.)

The regression model with the maximum predictive power is presented in Table 4. Twenty-nine percent of the variance in intent to participate is explained by financial motivations, past participation, past fencing, government information exposure, and self-efficacy.

The significant negative relationship between past participation and intended future behavior is contrary to previous research. As Table 5 indicates, of the 131 respondents who have not participated in the past, half are unlikely to participate in the future. Of the 76 total who have participated in the past, two-thirds said they would be likely to participate in the future. (It should be noted that past participation may have been in a different government program, not the current programs targeted by the agencies.) Landowners who participated in some kind of program may believe that additional participation is unnecessary and the riparian area needs no improvement. There may be a variety of reasons why respondents who have not participated in the past have little intention of doing so in the future; they may believe their riparian area to be in good condition, that obstacles to participation are too high, or that a government program is not a good solution.

Discussion

The maximum predictive regression model paints a picture of a likely participant as a landowner who is highly interested in financial motivations (such as cost-sharing), who has

received government information lately about riparian areas (and perhaps has an existing relationship with government officials), and who believes that the way he treats his land makes a difference in environmental quality. In addition, if an individual has participated in any kind of government program or has undertaken fencing (possibly at his own initiative), he still may not intend to participate in the future, regardless of whether program outcomes would differ.

Although environmental values and knowledge of the value of riparian areas were excluded from this regression model, these measures were nevertheless fairly important to this audience. Attitude toward the act of protecting water resources was high (3.5 of 5), as was knowledge of the value of riparian areas (3.8 of 5) and moral responsibility of protecting resources for the future (3.3 of 5). One contributing factor between the lack of relationship between environmental values and intent may be that respondents have a different evaluation of the current condition of their riparian area. Although the agencies report that a significant portion of riparian land in the state is degraded and in poor condition, the majority of respondents (84%) believe the riparian area on their land is in good or excellent condition.

There are several factors that may be involved in the lesser amount of variance explained by the TPB model than in the maximum predictive model. First, the target behavior is narrowly defined, and although voluntary, represents a monetary and more significant commitment. It was apparent that many of these landowners believe that they are already operating at the edge and would be highly motivated by costs and other assistance. In response to an open-ended question regarding the most important obstacle to upgrading the condition of their riparian area, 65% mentioned cost. Another 13% mentioned time or labor as the biggest obstacles. These landowners may not only disagree with land managers on what constitutes environmental damage,

they also may feel financially unable to correct it.

The significance of cost for this audience suggests that financial considerations may not be adequately measured with standard conceptualizations of PBC. The TPB may be fine for relatively simple, non-costly behaviors under volitional control (such as recycling or water conservation) but less accurate when monetary commitment increases. Lynne et al. (1995) concluded that the TPB pointed the way toward improving economic decision models, such as the Theory of Derived Demand. It may be that the inclusion of a financial variable in some models may strengthen the prediction of behaviors in which cost is a significant factor.

A second factor that may have affected the TPB findings here is the demographics of the respondents who were significantly older, widely ranging in education, and located in small, rural communities. Respondents reported that the traditional land use patterns of farming and ranching were considered the best use for their riparian areas, so therefore they may see little reason to change current practices without significant incentive. As new generations take over farm and ranch operations, and as land is increasingly converted to non-farm uses, attitudes toward riparian conservation may change. Among these respondents, there was a slight, significant, negative correlation (-.17, $p<.05$) between age and attitude toward the act of protecting water resources, and a slight, significant positive relationship (.14, $p<.05$) between education and environmental values. This suggests that younger and more educated landowners in charge of farms and ranches may possess different environmental sensibilities.

Finally, a third factor possibly affecting this outcome of the TPB involves the notion of "control." Fishbein (1993) noted that the theory of reasoned action may poorly predict behaviors requiring skills or resources outside an individual's control, hence the transformation into the TPB

by incorporating the variable perceived behavioral control. Operationalizations of PBC have included both perceptions of individual control stemming from internal or external sources, as well as measures of self-efficacy capabilities. But are these any better measures of "control"? The TPB is still on the level of individual perception and intention and may never be able to fully account for the many behaviors that are not simple matters of individual control but are intricately bound with the constraints of the social system. Even with the theory itself, there are inherent tensions between what could be considered the personal (attitudes and beliefs) and the social (social norms and external control). Because of the involvement of factors beyond the level of the individual, it is perhaps no wonder that the TPB has had varying success in predicting individual behavior without full consideration of the social.

In this study, the individual/social tension is particularly obvious in several ways. Riparian areas lie at the interface of private land and public waterway, and represent the essential tension of land management: private utilization of resources versus public stewardship of them. In a state with a significant amount of public land, government control (real or imagined) is a hot-button issue. On the matter of external PBC, less than a third of respondents agreed that the government was making it easier for them to take of resources on their land. In addition, in unsolicited comments, numerous respondents told interviewers about a poor past experience with a government agency or expressed confusion between agencies and their functions. Sentiment about government control may also be the reason for the large number of landowners who have not participated in past government-sponsored programs and have no intention of doing so in the future. For this population, it seems obvious that the respondents' perception of "control" over their behavior is a complex mixture of the individual-micro and the social-macro. It is then less

surprising that financial motivations were linked to behavioral intention, with landowners highly interested in what a government program could give them.

There are several limitations to the present study. First, the results are clearly not generalizable to the general population because rural riparian landowners and participation in government programs represent a specific audience and a specific behavior. As noted, the TPB may be better suited to more general audiences and widely defined behaviors.

Second, questions on the survey instrument sometimes had different numbers of response categories, which was noted by Sutton (1998) as problematic. All Likert type agree-disagree questions had five categories, but one series of questions had four choices (strongly disagree, disagree, agree, strongly disagree), a couple of questions (including one environmental measure taken from the General Social Survey) had only three, and measures of past behavior were yes-no responses.

Third, because of the sentiments toward government noted above, the measure for "attitude toward the act" was phrased generally about protecting water resources but was not specific to protecting water resources through a government program. While the intention was not to "show our hand" early in the survey, in hindsight the measure should have had more direct link to the government program.

Finally, this study did not follow-up with a later measure of actual participation, primarily because current participation in the target program is so low. In addition, there is confusion and a lack of distinction regarding current government programs for riparian areas. For example, of the 76 individuals who said they had participated in some kind of government-sponsored program for riparian landowners, almost none could recall the specific program name.

An obvious suggestion for future research utilizing the TPB is for scholars to explore creative ways to more fully incorporate external constraints and social barriers into the model. At the least, these findings suggest that financial variables can be important moderators of perceived behavioral control when the behavior requires resources outside an individual's control. The TPB holds even greater promise as a predictive model if it can more successfully negotiate the interface between individual attitude and volition and social constraints on them.

Table 1
Operationalization of Variables for Theory of Planned Behavior

Variable	Survey Question	Mean	SD
intention	Thinking into the future, how likely is it that you might someday participate in a government-sponsored riparian improvement program?	2.5	1.2
attitude toward act	I believe it is important to protect water resources.	3.5	.57
social norm	How my neighbors care for their property influences how I take care of mine.	2.5	.79
social norm - water	People I know believe that good stewardship of water resources is very important.	3.3	.53
self-efficacy	How I treat my land doesn't make much difference in the overall quality of the environment. (scaling reversed)	2.8	.82
PBC: internal	I am able to obtain the knowledge and resources I need to care for my land.	3.2	.49
PBC: external	The government is making it easier for me to take care of the natural resources on my land.	2.1	.77
environmental attitudes	The balance of nature is delicate.	3.1	.55
	Economic growth should be given priority, even if the environment suffers to some extent. (scaling reversed)	2.8	.74
	Would you say that the amount of money we spend as a nation to protect the environment is too much (1), too little (3), or about the right amount (2)?	2.0	.78
moral responsibility	It is my moral responsibility to protect the resources on my land for future generations.	3.3	.58

All questions (except third environmental attitudes question) were measured on 4-point scales. Intention: very unlikely (1) to very likely (4). All others: strongly disagree (1) to strongly agree (4).

Table 2
Pearson Correlation Coefficients for TPB Variables

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1. intent	—	.06	.00	.16	.16	.01	.11	.18	.11	.04	.08	-.34	-.25	-.14	.19	.33	.41	.22
2. attitude toward act		—	.23	.33	.08	.20	.03	.30	.15	.18	.39	-.01	-.06	.03	.13	.10	.06	.19
3. social norm - gen.			—	.08	-.13	.05	.17	.03	.09	.10	.11	.04	-.11	.02	.13	.02	.01	.12
4. social norm- water				—	.12	.20	.00	.35	.01	-.04	.34	-.03	.00	.01	.11	.10	.10	.12
5. self-efficacy					—	.13	.00	.05	.07	.04	.02	-.06	-.06	-.11	.10	.09	-.02	-.04
6. PBC - internal						—	.15	.17	-.05	-.09	.17	.05	.00	-.04	.12	.04	.01	.06
7. PBC - external							—	.10	-.01	.11	.08	-.15	-.15	.02	.02	.10	.10	.14
8. balance nature								—	.22	.08	.38	-.12	-.11	.01	.09	.17	.21	.25
9. environ - economy									—	.26	.17	-.08	-.08	.02	.08	.04	.00	.18
10. environ spending										—	.14	-.10	-.06	-.07	.15	.03	.10	.22
11. moral norm											—	-.06	-.14	-.04	.13	.17	.07	.32
12. past participation												—	.27	.13	-.24	-.34	-.25	-.23
13. past - fencing													—	.16	-.04	-.05	-.04	-.06
14. past - vegetation														—	-.26	-.03	-.13	-.12
15. info seeking															—	.32	.28	.16
16. info- government																—	.32	.23
17. motivations																	—	.36
18. knowledge																		—

Correlations greater than .14 significant at $p<.05$. Correlations greater than .20 significant at $p<.01$

Table 3
Regression Model of TPB Variables Predicting Behavioral Intention

Independent Variable	Beta	Partial correlations
attitude toward act	-.024	-.02
social norm – water	.146*	.15
social norm – general	-.025	-.03
PBC – internal	-.028	-.03
PBC – external	.059	.06
moral norm	-.038	-.04
self-efficacy	.083	.09
past behavior – vegetation	-.072	-.08
past behavior – fencing	-.172*	-.18
past behavior – participation	-.179*	-.18
information – media	.008	.01
information – neighbors	.033	.03
information – government	.223**	.21
information seeking	.013	.01

$R^2 = .23$, $p<.001$ ("enter" method, SPSS)

* $p<.05$, ** $p<.01$

Table 4
Maximum Predictive Stepwise Regression Model of Variables Predicting Behavioral Intention

Model & Variables	R2	Beta	Partial correlations
1. motivations	.16	.308**	.32
2. #1 + past participation	.22	-.150*	-.16
3. #2 + past behavior–fencing	.25	-.178**	-.20
4. #3 + information–government	.28	.165*	.18
5. #4 + self-efficacy	.29	.124*	.14

* p<.05, ** p<.01

Table 5
Intent to Participate and Past Participation

	unlikely - participate	likely - participate	Total
past participation - yes	24	52	76
(column %)	(21.8)	(53.6)	(36.7)
(row %)	(31.6)	(68.4)	(100)
past participation - no	86	45	131
(column %)	(78.2)	(46.4)	(63.3)
(row %)	(65.6)	(34.4)	(100)
Total	110	97	207
	(100)	(100)	(100)
	(53.2)	(46.8)	(100)

Chi-square = 22.4, p<.0001

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Experts in All Areas: Medical and Scientific Sources in Stories about AIDS

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Abstract

This study examines attributed comments made by medical and/or scientific (non-governmental) sources in news stories about AIDS in four elite and four non-elite newspapers during a nine-week period in late 1986 and early 1987. Results show that 38.4% of attributed comments made by medical and/or scientific (non-governmental) sources fell outside their areas of expertise. Elite newspapers published a higher percentage (43.2%) of such comments than non-elite newspapers (31.4%).

Traditionally, science and medical journalists are very dependent on scientific and medical sources, since many, at best, have only a minimal science background (Kinsella, 1989; Shilts, 1987). Scientific sources for biomedical stories are especially revered by journalists (McAllister, 1992). The scientific community, because of its long authoritative history, often has a significant influence on how media science reports are constructed (Dunwoody, 1999). Kinsella (1989) called this the "Gee Whiz" attitude of journalists toward science and medicine.

This has raised the concern of science communication scholars (Dunwoody, 1999; Friedman, 1986). McAllister (1992) said this almost unquestioning acceptance of scientific and medical sources is an example of the medicalization of society, which "highlights the expansive and political nature of medicine" as a form of cultural authority (p. 196). He warned that the dependence on these types of sources could further increase the medicalization of everyday life, with medical professional authority and medical ideology being applied to non-biomedical areas. Furthermore, McAllister (1992) speculated that journalists might use scientific and medical sources for opinions outside their traditional areas of expertise. This paper seeks to discover if this is the case. The literature is rife with hints that such an occurrence may already be happening.

Literature Review

Stempel and Culbertson (1984) found that physicians were the most frequent sources of medical news in Ohio's 11 largest daily newspapers. Physicians were

quoted in 42% of the articles examined and were also the dominant sources within most stories. Physicians dominated coverage in discussions of medical and surgical techniques and specific medical problems. However, they also dominated when quoted in stories dealing with how the health-care system works. When physicians were quoted in such stories, they were quoted more than all other sources 75% of the time. This is not to say physicians were the sources most quoted in health-care system stories (hospital administrators were at 24%) but, when they were cited as sources in given stories, they were the dominant sources. Stempel and Culbertson said dominance in this category could be a reflection of the power and status of physicians in society.

Goodell (1977) stated that some scientists became popular sources for media reports because they had been deemed credible in the past and were more adept than other scientists at communicating with the public and reporters. She also noted that a major reason why these scientists were used repeatedly is that they were willing to speak about topics tangential or unrelated to their areas of research expertise. Similarly, Schneider (1986), an atmospheric scientist, said that when he is interviewed he gives "a broad overview of the entire field with very little specialized detail" and that his colleagues "have become used to me as a self-ordained 'mouthpiece' for the field, and thus they expect me to describe more than my own work in interviews" (p. 218).

Dunwoody and Ryan (1987) surveyed scientists who had been used as news sources and found that 61% of those sampled said that at least a portion of their interviews dealt with topics outside their areas of expertise. Shepherd (1981), in his study of media coverage of marijuana research, found that the majority of the sources cited had done no such research. In fact, 70% of the sources were scientific bureaucrats.

The above studies are good bases for this investigation of the types of attributed comments made by medical and/or scientific (non-governmental) sources in newspaper stories about Acquired Immune Deficiency Syndrome (AIDS). To add context to the study, a short history of media coverage during the early stages of the AIDS epidemic follows.

AIDS media coverage in the early 1980s

The mainstream media were slow to publish reports about AIDS, even as the number of cases grew. Many have attributed the early lag in coverage to a reluctance by the media to publish stories about homosexuals (Altman, 1986; Nelkin, 1991; Shilts, 1987). During the initial stages of the epidemic, AIDS was perceived by many in the media and among the public as a "gay story."

Coverage expanded in 1983 following publication of a news release based on an editorial in the *Journal of the American Medical Association* (JAMA). Dr. Anthony Fauci, director of the National Institute of Allergy and Infectious Diseases and author of the editorial, suggested that routine household contact might spread AIDS. Thus, the editorial implied that AIDS could infect the general population. With society at large now deemed at potential risk, the news value of AIDS increased (Rogers, Dearing & Chang, 1991).

A dramatic increase in coverage occurred in 1985 after actor Rock Hudson was diagnosed with AIDS. Hudson's plight and that of Ryan White, a 13-year-old hemophilliac with AIDS who was barred from attending public school the same year, personalized and humanized AIDS and was critical in changing journalists' perceptions of the epidemic (Rogers, Dearing & Chang, 1991).

Although AIDS was now considered important news, Shilts (1987) wrote that one aspect of the epidemic was ignored by the media: the federal government's role in combating the virus. At this time, for example, the presidential administration of Ronald Reagan had not launched a coordinated AIDS prevention program. Furthermore, Reagan did not discuss AIDS during the first six years of his presidency (Perez & Dionisopoulos, 1995).

Comparisons of Elite and Non-Elite Newspapers

This project also seeks to analyze whether there are significant differences between elite and non-elite newspapers in the types of attributed comments made by medical and/or scientific (non-governmental) sources in their stories about AIDS.

While no previous studies have addressed differences between elite and non-elite newspapers in terms of statements made by medical and scientific sources, there has been some research comparing elite and non-elite newspaper coverage of science, health care and other areas.

Evans, Krippendorf, Yoon, Posluszny and Thomas (1990) compared science reporting in the prestige and national tabloid presses during September 1987. They found that the *New York Times* and *Phhiladelphia Inquirer* and the *National Enquirer* and *Star* featured the same type of science news in approximately the same proportions. Social science news accounted for the largest proportion of science news, with medical reporting the second most common type of story reported.

Evans et al. learned that research sponsored by the federal government was the leading institutional origin of science news in the prestige newspapers. But, in the tabloid press, university-originated research was most often covered. Reporting was found to be more

comprehensive in the prestige newspapers, although both types of publications often omitted methodological and contextual information.

Walsh-Childers, Chance and Swain (1999) in their study of newspaper coverage of the organization, delivery and financing of health care during 1993 found differences between how "major national newspapers" and other dailies report on health issues. The newspapers comprising the national category were the *New York Times, Washington Post, Los Angeles Times, Chicago Tribune, USA Today* and *Wall Street Journal.* With the exception of *USA Today,* all of these newspapers have been cited in various studies as members of the elite and/or prestige press (Merrill & Fisher, 1980; Stempel & Windhauser, 1984; Stempel & Windhauser, 1990).

Articles in the national newspapers tended to be substantially longer. The average length of stories in the regional or local papers was 897 words, while in the national newspapers the average story length was 1,138 words.

The researchers also found differences in source utilization. Academics were more than twice as likely to appear as sources in the national newspapers, and advocacy group representatives were also more likely to appear. There were no significant differences between the two groups in how often consumers, health professionals or politicians appeared.

In a study of minorities in health stories, Swain, Walsh-Childers and Chance (1996) reported that non-elite newspapers were twice as likely to focus on a specific minority group in their stories. Therefore, not surprisingly, 66% of the stories featuring headlines mentioning a minority group appeared in non-elite newspapers.

Lacy, Fico and Simon (1991) compared elite newspapers with other large circulation newspapers in terms of fairness and balance in reporting local controversies. The elite group was composed of the (Baltimore) *Sun, Atlanta Constitution, Chicago Tribune, Los Angeles Times,* (Louisville) *Courier-Journal, Milwaukee Journal, New York Times, St. Louis Post Dispatch* and the *Washington Post.* The papers making up the large circulation group were the *New York Daily News, New York Post, Detroit News, Chicago Sun-Times, Detroit Free Press, Newsday, San Francisco Chronicle, Cleveland Plain Dealer, Houston Chronicle, Minneapolis* Star *& Tribune, Philadelphia Inquirer* and *Boston Globe.* Two of the papers in the large circulation group, *the Philadelphia Inquirer* and the *Boston Globe* have also been cited as prestige and/or elite newspapers (Merrill & Fisher, 1980).

Lacy, Fico and Simon found that elite newspapers presented both sides of a controversy more often than large circulation newspapers. The average percentage of stories without both sides represented was 9% for the elite newspapers and 20.7% for the large circulation newspapers. Three newspapers, the *Los Angeles Times,* (Louisville) *Courier-Journal* and the *Minneapolis Star & Tribune* had both sides represented in all stories.

Elite newspapers also presented more balanced news stories than the large circulation newspapers. The difference in percentage of space given to the two sides averaged 23.5% for the elite newspapers and 31.9% for the large circulation newspapers. The top three performers in this category were the *New York Times, St. Louis Post Dispatch* and *Washington Post.*

Because past research provided no firm clues to how often scientific and/or medical

(non-governmental) sources are cited making comments outside their areas of expertise, the following research question is posed in order to gain data relevant to the issue:

RQ1: How often are scientific and/or medical sources in stories about AIDS cited making comments outside their areas of expertise?

However, the literature does suggest the following hypothesis:

H1: AIDS stories in elite newspapers will contain a significantly smaller percentage of attributed comments by scientific and medical (non-governmental) sources outside their areas of expertise.

Methodology

Content analysis was used to answer the research question and to test the hypothesis of this study. The data reported here was collected in an earlier content analysis study of newspaper coverage of AIDS before and after "*The Surgeon General's Report on Acquired Immune Deficiency Syndrome*" (Cassidy, 2000). Nine weeks of AIDS stories were analyzed—October 1 through November 11, 1986 and January 19 through February 8, 1987.

The newspapers examined in this study were chosen from (1) those cited as elite and/or prestige in various studies (Merrill & Fisher, 1980; Stempel & Windhauser, 1984; Stempel & Windhauser, 1989), and (2) that had competing dailies in their respective metropolitan areas during the specified time periods. The competing dailies were analyzed as well.

The metropolitan areas meeting these criteria are: Boston, Chicago, Los Angeles, Miami, Milwaukee, New York, Philadelphia, Tampa/St. Petersburg and Washington, DC.

The AIDS case rates of the top 50 metropolitan areas in population from the 1980 census were compiled using the number of AIDS cases reported to the Centers for Disease Control and Prevention (CDC) through March 1987 (CDC, 1989) to guide newspaper selection. A combination of newspapers from metropolitan areas with both high and low AIDS case rates was deemed optimal for this study. Geographic diversity was considered as well.

The elite newspapers analyzed were: the *Chicago Tribune, Los Angeles Times, Milwaukee Journal* and *New York Times.* The non-elite competing dailies analyzed were: the *Chicago Sun-Times,* the now defunct *Los Angeles Herald Examiner, Milwaukee Sentinel* and *New York Post.*

The eight newspapers selected provide a good mix in terms of the AIDS case rates in their respective metropolitan areas. New York City and Los Angeles had high case rates through March 1987 (107.98 per 100,000 population and 36.18, respectively) while Chicago and Milwaukee had substantially lower rates (8.86 per 100,000 population and 3.79, respectively). New York City ranked second to San Francisco in AIDS case rates through March 1987 among the top 50 metropolitan areas in population; Los Angeles ranked seventh; Chicago was twenty-fifth; Milwaukee was forty-third.

All stories cited under the subject heading of AIDS and/or Acquired Immune Deficiency Syndrome in the indexes of the *Chicago Tribune, Los Angeles Times* and *New York Times* during the specified time period were analyzed. There were no published indexes for the other newspapers in the study. Therefore, the author searched each issue of these newspapers during the specified time period for stories about AIDS. Editorial and op-ed pieces were included in the analysis, as were stories by columnists and those

appearing in weekend magazine supplements. Advice columnists such as Dear Abby and Ann Landers were not included.

The unit of analysis was the attributed comment (direct and indirect quotes). The types of sources were coded into 15 different categories in the initial analysis. For the purposes of this study only sources coded as medical and/or scientific (non-governmental) were examined. The definition for this category is: sources connected with the practice and/or study of medicine who do not hold governmental office or employment.

Attributed comments made by medical and/or scientific (non-governmental) sources were placed into nine categories. Using the research of Rogers, Dearing and Chang (1991) as a guide, those categories were: (1) epidemic, (2) biomedical, (3) prevention/risk, (4) government policy, (5) discrimination/civil rights, (6) societal knowledge, (7) ethics, (8) coping advice and (9) other. The first three categories can be more broadly categorized as medical comments (i.e., comments that fall under medical and/or scientific (non-governmental) source's areas of expertise), while four through eight can be categorized as comments that cover information for which medical and/or scientific (non-governmental) sources would not be considered experts.

The definitions of coding categories for attributed comments were:

Epidemic: comments regarding statistical facts and projections about the spread of AIDS.

Biomedical: comments regarding scientific research findings about AIDS, including its symptoms, the opportunistic infections associated with AIDS and the evolving definition of a person afflicted with AIDS. Also in this category are comments regarding

the medical treatments physicians give to their patients who are HIV-positive or who have AIDS and comments regarding statistical findings of a research study.

Prevention/risk: comments about methods for AIDS prevention and analyses of the risks of contracting the HIV virus through various behaviors.

Government policy: comments regarding governmental action or inaction for AIDS, such as school sex education and budget allocations for AIDS. This category includes proposed governmental action and comments regarding the problems the AIDS epidemic has caused or will cause governmental agencies.

Discrimination/civil rights: comments regarding unfair treatment of people with AIDS and about privacy and civil rights issues related to AIDS. Examples of such comments are those about health care workers who refuse to provide medical services to AIDS sufferers and those about the controversy over mandatory testing for HIV infection.

Ethics: comments regarding the moral dilemmas and judgments brought on by the AIDS epidemic, such as the portrayal of AIDS as God's punishment, not making experimental drugs available to all AIDS patients who want them and whether a physician suffering from AIDS should be able to treat patients.

Societal knowledge: comments regarding what AIDS sufferers and other members of the public know and/or should know about AIDS and about what can be learned from the epidemic.

Coping Advice: comments regarding how to cope with an HIV or AIDS diagnosis and how persons diagnosed with HIV or AIDS have dealt with their illness. This category does not include advice given about AIDS prevention.

Other: comments that do not fit into any of the above categories.

Intercoder Reliability

Four coders other than the author were divided into two teams. Each team coded half of the stories (N=520) in the study and the author coded all the stories. Thus, each story was analyzed by three coders. The source of an attributed comment was placed into a given category when two of the three coders agreed that was the most appropriate category. Comments attributed to medical and/or scientific (non-governmental) sources were handled in the same manner. Any source of attributed comment placed into three different categories was not used.

Usiing Holsti's (1969) formula for intercoder reliability, the percentage of agreement for source affiliation of those making attributed comments was 90.9% for "Team A" and 92.1% for "Team B." The percentage of agreement on types of attributed comments made by medical and/or scientific sources (non-governmental) was 73.6% and 73.9%, respectively. Given the complexity of the coding decisions, this level of intercoder reliability seems acceptable.

Results

Of the 520 stories studied, 291 (55.9%) were published in the elite newspapers, while 229 (44.1%) were published in the non-elite newspapers. Among individual newspapers, the *Los Angeles Times* and *New York Times* each published 82 (15.8%) stories about AIDS during the time period of this study. The *Milwaukee Sentinel,* with 27 (5.2%) ran the smallest number of AIDS stories

The 520 stories yielded 801 attributed comments by medical and/or scientific

(non-governmental) sources. Of the 801 comments, 108 (13.4%) were coded in the "other" category. Those attributed comments, as well as 11 others the coders could not agree on a proper category for, were not used in the final analysis. Therefore, 682 (n=682) attributed comments by medical and/or scientific (non-governmental) sources were examined to answer the research question and test the hypothesis of this study. Elite newspapers published 402 (58.9%) of the attributed comments analyzed, while the non-elite papers published 280 (41.1%).

Data relating to the research question—how often are medical and/or scientific (non-governmental) sources in stories about AIDS cited making comments outside their areas of expertise?—are reported in Table 1.

Data show that 420 (61.6%) of the attributed comments were medical, while 262 (38.4%) were outside these sources' areas of expertise. Biomedical was the leading category with 262 (38.4%) of the attributed comments falling into this category. However, the second leading category was government policy, with 124 (18.1%) attributed comments.

The hypothesis states that AIDS stories in the elite newspapers will contain a significantly smaller percentage of attributed comments by medical and/or scientific (non-governmental) sources outside their areas of expertise. To test whether the data supported the hypothesis, a chi-square analysis was performed on the percentages of attributed comments made by medical and/or scientific (non-governmental) sources outside their areas of expertise in the elite and non-elite newspapers.

Table 2 shows that 174 (43.2%) of the 402 attributed comments by medical and/or scientific (non-governmental) in elite newspapers were outside their areas of expertise.

Of the 280 attributed comments in the non-elite newspapers, 88 (31.4%) were outside medical and/or scientific (non-governmental) sources' areas of expertise.

Therefore, the hypothesis is clearly not supported. However, the chi-square analysis showed significant differences at the .10 level in the direction opposite to that predicted ($X2 = 3.34$, d.f. = 1, $p. < .10$).

Discussion

Limitations of Study

While this study presents some useful information, it is not without limitations.

First, it is not a complete representation of how the media use medical and/or scientific (non-governmental) sources. Only newspaper stories about one issue (AIDS) were examined and only a nine-week period of coverage was analyzed. However, other studies comparing how different types of publications cover science (Evans, et al.; 1990) and differences between elite and non-elite newspapers (Lacy, Fico & Simon, 1991) looked at shorter time periods than this study. This study also didn't code whether a story was staff written or from a wire service. However, since all the newspapers studied had large circulations, it was assumed that they all had the editorial resources necessary to cover the issue, and thus were not dependent on wire services. Lacy (1987) found that circulation size was positively related to the amount of financial commitment to newspapers' news departments.

The results are based on information published in 1986 and 1987. While utilization of of medical and/or scientific (non-governmental) sources may have changed since that time, studies such as Agoston (1996) and Rogers, Dearing and Chang (1991) have shown this was when the number of AIDS stories published was at its peak.

A methodological problem occurred when analyzing the attributed comments of medical and/or scientific (non-governmental) sources. Due to a lack of prior research about the types of comments these sources might make, the author was able only to consult studies that examined story categories in AIDS coverage, such as that of Rogers, Dearing and Chang (1991) and use his own critical examination of AIDS stories for guidance in determining content categories.

As a result, a fairly large percentage (13.4%) of the attributed comments were coded as "other." Qualitative observation revealed that the majority of these comments could be deemed outside the areas of expertise of medical and/or scientific (non-governmental) sources, but there were not appropriate coding categories for them. Thus, as mentioned earlier, these comments were not used in the final analysis.

Summary Conclusions

Medicalization scholars would argue that the findings of this study document medicine's intrusion into other aspects of modern life as well as the increasing power of physicians and medical researchers as authoritative figures in society. Apparently, medical sources are so revered for their mastery of such a complex and technical area of knowledge, journalists are likely to solicit their views on other areas.

This inclination may be all the more tempting with a topic such as AIDS. Although, essentially a medical and scientific story, AIDS has transcended the traditional boundaries of illness and medicine and affected a host of other facets of life, such as public policy, the legal system and sex education in schools. According to Shilts (1987), the media initially assigned their science reporters to cover AIDS. These reporters preferred to deal with the medical and scientific aspects of the epidemic. Thus, it seems

quite natural that medical and scientific sources would be heavily utilized by these reporters. However, evidence from other studies (Cassidy, 2000; Rogers, Dearing and Chang, 1991; Shilts, 1987) suggest that during the time frame of this study, the manner in which the media framed the epidemic was undergoing a transition.

Gitlin (1980) describes news frames as: "persistent patterns of cognition, interpretation and presentation, of selection, emphasis and exclusion by which symbol-handlers routinely organize discourse, whether verbal or visual" (p. 7). News frames, Gitlin said, organize the world for journalists and enable them to process large amounts of information routinely and quickly for effective presentation to their audiences.

Cassidy (2000) found that use of government sources increased significantly during this time, although they accounted for less than 5% of sources cited. Shilts (1987) said publication of *"The Surgeon General's Report on Acquired Immune Deficiency Syndrome"* (which occurred during the time frame of this study) "galvanized the media and allowed AIDS to achieve the critical mass to make it a pivotal social issue of 1987" (p. 587). Rogers, Dearing and Chang (1991) discovered that government policy led all other types of AIDS stories in a time period occurring primarily just after that of this study (February 1987 through December 1988) by nearly-two-to-one.

So, perhaps journalists were beginning to realize the epidemic transcended the traditional boundaries of illness. But, instead of utilizing other types of sources for stories on political and social aspects of the epidemic, it appears that during this time journalists continued to seek out "familiar" medical and scientific sources. However, it seems they adjusted how they used these sources. Therefore, AIDS could prove to be a special case

of journalists asking medical and scientific sources to comment on areas outside their traditional areas of expertise. Studies of attributed comments made by sources in stories about other scientific and medical topics are needed.

The overall finding that 38.4% of the attributed comments made by medical and/or scientific (non-governmental) sources were in areas outside of their areas of expertise, matches up well with the results of Dunwoody and Ryan (1987), who in their survey found that there was a one in three chance that scientists would be asked about a topic that had little to do with his or her research area.

To illustrate these occurrences, Dunwoody and Ryan (1987) give a few examples; noting that one biologist who studies animal behavior was asked about bird migration as well as the likelihood of spotting specific types of birds in the local areas. Clearly, those topics bear little relation to that scientist's research expertise. But, at least the questions concerned science.

Table 1 shows that many of the comments attributed to medical and/or scientific (non-governmental) sources were in areas that had nothing to do with medicine or science. Here is a pair of examples:

Dr. Margaret Nichols, executive director of the Hyacinth Foundation, which had received a contract from the New Jersey Department of Health to provide services to AIDS sufferers told the *New York Times*, "If you have AIDS, you are better off if you don't live in New Jersey" (Gutis, 1986, p. B1).

The *Los Angeles Times* quoted Dr. David Baltimore of the Whitehead Institute for Biomedical Research and Massachusetts Institute of Technology as saying that the AIDS crisis "is of the magnitude that requires presidential leadership" (Cimons, 1986, p. 1).

The most compelling results of this study center on the hypothesis, which predicted that the percentage of attributed comments by medical and/or scientific (non-governmental) sources outside their areas of expertise would be significantly smaller in elite newspapers. This was most emphatically not the case. A total of 43.2% of the attributed comments by medical and/or scientific (non-governmental) sources in elite newspapers were outside their areas of expertise, while the figure was 31.4% in non-elite newspapers.

What accounts for this surprising finding? The elite press are supposed to represent the best in American journalism (Lacy, Fico & Simon, 1991; Stempel & Windhauser, 1984). Does this mean it has become standard practice for journalists to utilize medical and/or scientific (non-governmental) sources to comment on topics outside their areas of expertise? If so, this is a disturbing occurrence. Obviously, much more research needs to be performed in this area.

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Table 1

Attributed Comments by Category

Category	Frequency (N=682)	Percent
Epidemic*	59	8.7
Biomedical*	262	38.4
Prevention/Risk*	99	14.5
Government Policy**	124	18.1
Discrimination/Civil Rights**	55	8.1
Societal Knowledge**	36	5.3
Ethics**	38	5.6
Coping Advice*	9	1.3

*Medical Comments

**Non-medical Comments

Table 2

Comparison of Percentages of Medical and Non-medical Comments by Newspaper Type

Newspaper Type	Medical	Non-Medical
Elite	56.8	43.2*
Non-elite	68.6	31.4

*Difference between percentage of non-medical comments significant at .10 level.

Get Excited! Be Calm!

An Examination of Risk-inducing and Risk-reducing Statements in Food-Safety Messages

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75-word Abstract

Risk perception is a well-established factor impacting a host of human behaviors. As such, risk communicators are often motivated to stimulate or allay emotional reactions to physical hazards. This study questioned if governmental versus private sponsorship of food-safety messages was related to the amount of risk-inducing and risk-reducing statements in those messages. Results of a quantitative content analysis found that governmental communicators are saying "get excited," while private communicators are asking consumers to "be calm."

RUNNING HEAD: GET EXCITED! BE CALM!

Get Excited! Be Calm!
An Examination of Risk-inducing and Risk-reducing Statements in Food-Safety Messages

Abstract

Communication about physical hazards is necessarily, and intricately, linked to message consumers' risk perceptions about those hazards. Since risk perception is a well-established factor impacting a host of human behaviors, communicators are often motivated to stimulate or allay emotional reactions. This study questioned if governmental versus private sponsorship of food-safety messages was related to amount of risk-inducing and risk-reducing content found in the messages designed to promote safe food handling. Over three thousand units of analysis from nationally distributed food-safety messages were examined. Almost ten percent of those units were dedicated to either risk-inducing or risk-reducing statements. Governmental communicators were much more likely to include risk-inducing statements and much less likely to include risk-reducing statements. In direct contrast, private communicators were much less likely to include risk-inducing statements and more likely to include risk-reducing statements. Both in volume and proportion, results show that governmental communicators are saying "get excited," while private communicators are asking consumers to "be calm."

75-word Abstract

Risk perception is a well-established factor impacting a host of human behaviors. As such, risk communicators are often motivated to stimulate or allay emotional reactions to physical hazards. This study questioned if governmental versus private sponsorship of food-safety messages was related to the amount of risk-inducing and risk-reducing statements in those messages. Results of a quantitative content analysis found that governmental communicators are saying "get excited," while private communicators are asking consumers to "be calm."

Get Excited! Be Calm!
An Examination of Risk-inducing and Risk-reducing Statements in Food-Safety Messages

Risk perceptions--the level of concern caused by some hazard-- has been identified as a significant variable affecting a host of human activities. Risk perceptions associated with food products, for example, have sponsored large-scale changes in consumer preferences, have spurred public demands for regulation, and are a significant variable affecting the likelihood that one will engage in preventive health behaviors such as avoiding undercooked ground beef. Communicating about hazards is necessarily, and intricately, linked to message consumers' perceptions of risk. Risk communicators are constantly challenged to communicate about physical hazards--those hazards, natural or man-made, that may result in injury or death and, therefore, are constantly engaged in the practice of stimulating publics to either get excited or be calm.

On one hand, communicators face the challenge of stimulating perceptions of risk about some hazard to an apathetic public. For example, the public health advocate encouraging bicycle helmet usage or promoting radon testing in homes must convince a public that a risk exists where none had been perceived before. On the other hand, communicators may face the opposite task of reducing perceptions of risk and allaying fear. Stereotypical examples include advocates of nuclear power and the communication staffs of chemical manufacturers who are challenged to convince publics that their industries pose small and/or acceptable levels of risk.

Often, risk communicators are agents or employees of groups who have vested interest in a particular public's level of excitement or calmness. Message receivers and

critics alike frequently recognize these communicators' motivations and lambaste them as in the recent publication of *Trust Us, We're Experts: How Industry Manipulates Science and Gambles with Your Future* (Rampton & Stauber 2001). This scathing text highlights an assumed model that positions risk communication as an endeavor that seems to oversimplify complex topics into good or bad, pro or con, black or white. While a dichotomized model of risk communication objectives is conceptually convenient, it doesn't reflect a complex world where communicators juggle multiple, sometime conflicting, communicative objectives.

This study examines the content of publications designed to promote behaviors that prevent foodborne illnesses---meaning illnesses caused consumption of food products containing microbial pathogens (bacteria, viruses, and parasites) such as Samonella and E coli. Since a variety of sponsors, both private and governmental, distribute such messages, this study affords an opportunity to examine how communication about physical hazards differs based on the communicator's self-interest. By identifying the risk-inducing and risk-reducing content in messages by sponsor, this research offers insight into the ways that risk communicators respond to the multiple, conflicting communication objectives presented in their complex communicative environments.

Risk Perceptions and Foodborne Illness

While many believe food-safety issues are relevant only to developing countries, foodborne illness represents a serious health hazard in the United States. Scientists (Mead et al. 1999) estimate that consumption of food containing microbial pathogens (bacteria, viruses, and parasites) causes 76 million cases of illness, 325,000 hospitalizations and

5,000 deaths in the United States each year (Mead et al. 1999). However, studies find that food-safety compliance is low among American adults, suggesting that past communication campaigns have been less than effective (Altekruse, Street, Fein & Levy, 1996; Centers for Disease Control and Prevention, 1996; McIntosh, Acuff, Christensen & Hale, 1994; Williamson, Gravani & Lawless. 1992; Yang, et al. 1998). Since foodborne illness can often be prevented by an individual's behavior, communication campaigns aimed at gaining food-safety compliance will be a major tool in efforts to reduce the incidence of foodborne illness.

Those concerned with preventive health behaviors often believe that higher perceptions of risk result in efficacious responses towards health threats. Both the Health Belief Model (HBM) (Rosentstock, 1974) and the Extended Parallel Processing Model (EPPM) (Witte, 1992a) explicitly consider perceptions of threat to be a determinate of health behaviors. Similarly, correlations between risk perceptions and adaptive health behaviors have been found in several studies (Rosenstock, 1974; Witte, 1992a, 1992b, 1993, 1994a, 1994b, 1997; Witte & Morrison, 1995; Witte, et al. 1996; Witte, Stokols, Ituarte & Schneider, 1993; Witte & Zmuidzinas, 1992).

However, excessive risk perceptions may interact with perceptions of self in dynamic ways. Witte (1992a) argues, for example, that excessive feelings of fear in combination with low self-efficacy (belief that one can do little or nothing to alter threat) result in the rejection of health messages and are associated with fatalism and risky behaviors. Since the current research focuses specifically on personal food-safety behaviors, which has been identified as a risk having characteristics unlikely to create feeling of distress (Sandman, 1987), it is argued that statements that increase risk

perceptions will contribute to message effectiveness. Therefore, one would expect that copy writers would create messages that communicate risks associated with foodborne illness--messages that encourage consumer to "get excited" about the foodborne illness hazard.

Research Questions

Searle's (1970) Theory of Speech Acts explicates the two-fold function of speech. He distinguishes between speech's propositional indicators and its illocutionary indicators: "A proposition is what is asserted in the act of asserting, what is stated in the act of stating" (Searle, 1970, p. 29). In contrast, illocution is the act speakers are performing when they make an utterance. Examples of speech acts are warning, questioning, greeting, and requesting. A statement such as "Food poisoning often causes acute abdominal cramping and vomiting" has content or the proposition of describing symptoms. The illocutionary act is that of assertion. The statement functions to heighten the reader's perceptions of risk. It is a risk-inducing statement that communicates "get excited!" In contrast a risk-reducing statement communicates "be calm." An example of a risk-reducing statement is "The United States offers one of the safest food supplies in the world." Such a statement functions to reduce negative emotional reactions to the hazard of foodborne illness. This research ask:

RQ1 To what degree foodborne illness prevention messages contain risk-inducing and risk-reducing statements?

RQ2 Is the occurrence of risk-inducing statements in foodborne illness prevention messages different among sponsors?

RQ3 Is the occurrence of risk-reducing statements in foodborne illness prevention messages different among sponsors?

This study also asks if copywriters were more likely to include statements that communicated positive attributes of food products based on their affiliation. Therefore, research question four is:

RQ4 Is the occurrence of food quality statements in foodborne illness prevention messages different among sponsors?

Method

To answer the research questions, a content analysis was performed to identify the occurrence of specific statement types in food-safety messages.

Data Collection

Nationally distributed messages which were designed for adults and which addressed foodborne illness-safety issues relating to personal behavior were the population of this study. Artifacts--complete nationally distributed messages--came from a variety of sources including governmental communicators, private communicators (both profit and nonprofit) and from collaborations among these two groups. Examples of governmental communicators include the Centers for Disease Control and Prevention and the United States Department of Agriculture. Examples of private communicators include the International Food Safety Council, the American Dietetic Association, and the American Egg Board as well as other industry trade organizations. The National Food Safety Database was highly utilized in the collection of artifacts. In addition to database utilization, over twenty private and governmental sources were contacted and requested

to submit and suggest materials appropriate to the study. Food-safety promotional materials were also collected directly from the USDA Food Safety and Inspection Service in Washington, D.C. and public end distribution points. The Internet was also used to gather artifacts, especially in the case of the three most prominent national governmental entities involved in food-safety issues: the United States Department of Agriculture, the Food and Drug Administration, and the Centers for Disease Control and Prevention. The materials collected constitute a best effort at generating a complete set of nationally distributed food-safety promotional materials that were readily available from 1997 through 1999.

Coding

Because sentences are large enough to identify the illocutionary textual features under study yet small enough to code reliably, sentences were the units of analysis for this study. Two coders working independently processed the artifacts to identify the units of analysis and to identify the statement types examined in this study. No units were coded twice. Compound sentences and sentences reflecting more than one statement type were assigned to the statement type that was most dominant. Data were analyzed using the SPSS 10 Macintosh version.

Risk-Inducing Statements

Risk statements are textual units that support the notion that food-safety messages should communicate "get excited." Specifically, units of analysis that (a) state some situation is wrong or dangerous; (b) state medical/physical consequences including symptoms, time of onset, or duration of illness; (c) state other consequences such as epidemics, numbers of persons affected, time lost due to illnesses, or psychological or economic impacts of

illness; or (d) emphasize susceptibility by stating or illustrating that the consumer or someone else is at risk were coded risk-inducing statements. Examples of risk-inducing statements include: "Undercooked hamburger patties may be dangerous" and "Common symptoms of foodborne illness include diarrhea, abdominal cramps, fever, headache and vomiting."

Risk-Reducing Statements

Risk-reducing statements are textual units that support the notion that food-safety messages may be communicating "be calm." Specifically, units of analysis that (a) emphasize that contamination or negative health effects are unlikely; (b) explain dynamics that prevent contamination; (c) state hazard-reducing activities of industry and/or government including research activities, inspections, or other preventive measures; (d) state industry and/or government acknowledgement of safe food goal/importance; and (e) emphasize safety of food products were coded as risk-reducing statements. Examples of risk-reducing statements include: "The United States offers one of the safest food supplies in the world." and "Companies must follow rigorous sanitation standards on facility cleanliness and worker hygiene, and maintain monitoring records of these activities."

Food Quality Statements

Food quality statements are statements that (a) emphasize health or nutritional benefits of product; (b) emphasize taste, convenience, or other desirable characteristic; (c) explain food quality and duration of food quality. An example of a food quality statement is "Turkey is a nutrient dense, low-fat, high-protein food that is available at a relatively low price."

Results

Fifty-seven artifacts--complete foodborne illness prevention messages--were examined. Twenty-five of the artifacts were sponsored by government entities, 23 were sponsored by private organizations, and nine artifacts were cooperatively sponsored by government and private interests. Artifacts included 22 webpages, 14 flyers, 13 brochures, five booklets, one laminated placard, one stick-on label, and one fax-on-demand.

The total number of units of analysis, or "statements," was 3,359. The mean number of statements per artifact was 58.93 (SD = 39.38). The fewest number of statements in any one artifact was 6; the longest artifact had 202 statements.

Coding was completed in two rounds. The first round, which included the coding of risk-inducing statements, involved sixteen artifacts (28%) which were coded independently by two coders. For the 1007 units of analysis contained in the 16 artifacts, the two coders disagreed 87 times resulting in 91.36% agreement. Round two of coding identified risk-reducing and food quality statements from a pool of 921 statements not previously categorized in round one. For 340 statements coded independently, the coders agreed 88.5% of the time.

The volume of statements attributable to governmental and privately sponsored artifacts was highly similar. Twenty-five governmental artifacts contained 1,510 units of analysis, and 23 privately sponsored artifacts contained 1,389 units of analysis. The nine cooperatively sponsored artifacts accounted for 460 units of analysis. The majority of the cooperatively sponsored artifacts was products of the FightBac! campaign, an effort of the Partnership for Food Safety Education. Given the similarity between the

governmentally and privately sponsored artifacts, both of which averaged 60 units of analysis per message, remaining analysis will report total occurrences and mean number of occurrences of statement types.

Occurrences of Statement Types

In sum, risk-inducing, risk-reducing, and food quality statements accounted for 353 of the total 3, 359 units of analysis (10.5%). Risk-inducing statements appeared 251 times accounting for 7.5% of all units; risk reducing, 78 times accounting for 2.3% of all units; and food quality, 24 times accounting for less than 1% of all units. Table 1 summarizes the occurrence of the statements types split by sponsor.

Table 1

Number of Statement Types by Sponsor

	Government n=25	Private n=23	Cooperative n=9
Risk-inducing Statements	152	78	21
Risk-reducing Statements	27	47	4
Food Quality Statements	5	16	3

Since cooperatively sponsored artifacts accounted for so few statement types under study, such artifacts will not be included in further analysis in this paper. Table 2 provides the mean number of occurrences of statement types in messages split by sponsor

along with standard deviations. The large standard deviations associated with these means indicates that some messages may have contained few, if any, of a particular statement type while other messages may have prominently featured particular statement types.

Table 2

Mean Number of Statement Types by Sponsor

	Government n=25	Private n=23
Risk-inducing Statements	6.08 (9.28)	3.39 (10.45)
Risk-reducing Statements	1.08 (1.68)	2.04 (3.74)
Food Quality Statements	.20 (.82)	.70 (2.14)

Note. Standard deviations appear in parenthesis.

Discussion

In response to the first research question as to the degree of risk-inducing and risk-reducing statements found in foodborne illness prevention messages, findings show that such statements account for almost one tenth (9.8%) of total units of analysis. Overall, risk-inducing statements occurred more than thee times as often as risk-reducing

statements, which is in line with the notion that food-safety messages should be steering consumers to "get excited" about foodborne illness risk.

Research questions two and three asked if the occurrence of statements would be different based on sponsorship. Results show a clear trend suggesting that communicators' complex, often conflicting communication objectives are reflected in the content of their food-safety messages. While an industry promotion agency wants to promote safe food handling, it is also motivated to discourage high levels of anxiety about its product. Findings show that governmental communicators were nearly twice as likely to include risk-inducing statements than were private communicators. In contrast, private communicators were nearly twice as likely to include risk-reducing statements than were governmental communicators.

Within governmentally sponsored artifacts, each risk-reducing statement was associated with 5.63 risk-inducing statements. Within privately sponsored artifacts, each risk-reducing statement was associated with 1.66 risk-inducing statements. While both sponsorship categories were more likely to include risk-inducing, rather than risk-reducing statements, copywriters for governmental food-safety publications provided more risk-inducing content as well as larger proportions of risk-inducing statements. In short, governmental publications were more likely to indicate that publics should "get excited," while private communicators were more likely to have content structures that encourage consumers to "be calm."

Finally, the extent to which artifacts communicated the positive attributes of food products was questioned. Overall, such statements occurred infrequently, accounting for less than one percent of all units of analysis. Governmental publications only had five

such statements, while privately sponsored messages contained 16. Even though private communicators were three times as likely to include statements touting food products, the infrequent occurrences of such statements do not support a claim that private communicators allow motivations to promote a particular food product overpower motivations to promote safe food handling behaviors.

Summary

Communication about physical hazards is necessarily, and intricately, linked to message consumers' perceptions of risk about those hazards. Since risk perception is a well-established factor impacting a host of human behaviors, communicators are often motivated to stimulate or allay emotional reactions. The complexities of communicative environments, however, often present communicators with multiple, sometimes competing, objectives.

Relating to foodborne illness prevention messages, previous research indicates that increased perceptions of risk are correlated with adoption of preventive health behaviors. While health advocates and governmental entities may be very motivated to stimulate feelings of concern, food marketers and industry associations must balance motivations to promote health with motivations to successfully market food products.

This study questioned if governmental versus private sponsorship of food-safety messages was related to message content. Over three thousand units of analysis from nationally distributed food-safety messages were examined. Almost ten percent of those units of analysis were dedicated to risk-inducing statements and risk-reducing statements. Governmental communicators were much more likely to include risk-inducing statements and much less likely to include risk-reducing statements. In direct contrast, private

communicators were much more likely to include risk-reducing statements and much less likely to include risk-inducing statements. Both in volume and proportion, results show that governmental communicators are saying "get excited," while private communicators are asking consumers to "be calm."

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Media Effects on Public Understanding of Salmon Recovery: The Role of Information Processing

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Media Effects on Public Understanding of Salmon Recovery:
The Role of Information Processing

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Abstract

Weak and inconsistent effects have been reported in recent reviews of research on media contributions to public understanding of environmental problems. A random digit dialing (RDD) telephone survey incorporated a new measure of receiver engagement with media content, as well as new measures of public understanding focused on the political and economic dimensions of a regional environmental problem. The study found that the amount of receiver engagement made a significant difference in effects on public understanding.

Media Effects on Public Understanding of Salmon Recovery: The Role of Information Processing

Introduction

What contributions do mass media make to solving environmental problems? Few would doubt the importance of the question. Unfortunately, there seem to be as many different answers as there are researchers who have studied the question. The answers range from apparently dysfunctional contributions, such as creating a sense of "well-informed futility" (Wiebe, 1973) to positive contributions such as lessening the resistance to governmental spending on environmental programs (Gerbner, et al., 1982).

Despite the broad range of findings, the emerging consensus in the literature emphasizes the relative absence of positive contributions. A recent review concludes that even though present theory (e.g., cultivation theory and agenda setting) suggests that media portrayals should shape public perceptions of environmental problems in obvious and direct ways, few studies show strong effects (McComas & Shanahan, 1999). Also, attention has been drawn to a negative relationship between environmental concern and television viewing, interpreted as a "retarding effect" of heavy viewing (Shanahan & McComas, 1999). Other investigators have linked media coverage of climate change to public confusion between global warming and ozone depletion (Kempton, 1991; Bostrom, Morgan, Fischhoff & Read, 1994).

Typically, the occurrence of these weak and/or counterproductive contributions is attributed to failings in media coverage. Coverage of climate change is said to be confused and misleading (Kempton, 1997), and coverage of most problems shallow and episodic (Friedman, 1990). Recent analysis of environmental "narratives" on television calls attention to a tendency to favor a "dominant social paradigm" of economic progress and consumerism while minimizing and trivializing environmental concerns (Shanahan & McComas, 1999).

The situation is partly reminiscent of the literature on media effects and political knowledge in the 1980s. At that time a number of researchers argued that deficiencies in media coverage of elections resulted in effects on candidate images with little contribution to understanding of political issues (see, for example, McCombs, 1972). In

particular, television was singled out as having null or negative impact on political understanding. (cf., Patterson & McClure, 1976; Becker & Whitney, 1980).

Conceptualization

In this article we argue that the apparent weakness of media contributions to public understanding of environmental problems may stem from: (1) a deficiency in the theories of effects that we employ, and (2) a limited view of what constitutes public understanding. Bulkeley (2000) has recently called attention to our tendency to embrace an "information deficit" model, which implies that public ignorance about environmental problems is the primary barrier to public involvement and action. The model ignores the vital role of individual differences in information processing, assuming that increased dissemination of scientific information is sufficient to create understanding and change. It also characterizes the public as misinformed based on lack of familiarity with scientific discourse, which misrepresents the nature of public understanding.

Agenda setting and cultivation, the two theories most often applied to communication studies of environmental problems, are similarly deficient. Both assume that media effects on public understanding are a result of exposure to whatever is repeatedly emphasized in media portrayals of environmental problems. Although there is some empirical evidence consistent with both theories (Trumbo & Shanahan, 2000), neither theory considers the important role of individual communication behavior (e.g., "information processing"). It is assumed that media effects are a direct result of exposure to media content, although other recent theorizing argues effects cannot be adequately understood without considering processes of attention and cognition (cf., Lang, 1990; Myers & Biocca, 1992; Botta, 1999).

Both theories also assume that public understanding mirrors the content of media coverage. Thus, researchers would be led to search for correspondences between a "media agenda" and a "public agenda," (Trumbo, 1995) or between media narratives and public perceptions (McComas & Shanahan, 1999). This is useful in so much as it helps direct our attention to particular effects, such as "mental images" that in some respects reflect media portrayals of climate change (Kempton, 1991). But it may also fail to

direct our attention toward some important questions about public understanding, such as what kinds of understanding are instrumental to public involvement in collective action (Bulkeley, 2000), and in what ways does public understanding differ from media portrayals? According to Bulkeley, research has sometimes misrepresented public understanding as "illiterate and ill-informed" because of a failure to recognize its fluid, complex and contradictory nature.

The role of information processing

Research on media effects has increasingly concerned itself with the receiver's role in producing communication effects. The premise underlying this interest is that receiver processing behavior is highly variable. There are times when individuals process political information carefully, and times when they do not (Tewksbury, 1999). Some individuals may watch television passively with little attention or elaboration, while others engage in active, elaborative processing (Shrum, 1995). Also, there are likely to be between-individual and between-issue differences in attention to environmental coverage based on need-to-know (Ungar, 2000). Grunig's research identified "environmentalist" publics on most issues, consisting of individuals who actively process information but require more action-oriented information than is provided in most general media coverage (Grunig, 1983).

If individual processing of media coverage is highly variable, a number of questions are raised about effects. Most notably in the present context, is availability of certain messages and/or exposure to them an adequate basis for understanding effects? According to Shrum (1995) the understanding of effects cannot be complete unless we articulate the process by which it occurs. Only then can we explain why an effect occurs, or why it does not.

Several researchers have observed that acquisition of political knowledge cannot be adequately explained in terms of "habitual media consumption," but rather in terms whether or not individuals are "paying attention" (Chaffee, Ward & Tipton, 1970; Chaffee & Schleuder, 1986; McDevitt & Chaffee, 2000; McLeod & McDonald, 1985). For example, inconsistent and contradictory findings for the effects of body image

messages on teenage girls have recently been explained in part by differences in the processing of these images, those not engaging in critical viewing being the most susceptible to body image disturbance (Botta, 1999).

As regards media effects on public understanding of environmental problems, it is important to ask whether weak and/or limited effects could be due to information processing that is inattentive, and whether stronger effects are associated with closer attention. Ungar (2000) contends that for most issues the broad public is at best semi-attentive, and approaches media content with an entertainment-oriented mind set. Although a number of studies have found agenda setting effects for environmental coverage, Gooch (1996) observes that most such effects are weak because of the manner in which people process the information they receive.

In studying media effects on political knowledge Chaffee & Schleuder (1986) demonstrated that previously reported negative associations between knowledge and television use were reversed if attention to television was considered. Similarly, the inclusion of attention measures revealed positive associations between political knowledge and attention to both radio and television (Stamm, et al., 1996). In this study we employ a model of media engagement that distinguishes two "levels" of information processing beyond simple exposure—**attention** (focusing on the problem), and **cognition** (thinking about it) (Kim, Carter & Stamm, 1996).

The nature of public understanding

The study of media effects on public understanding, while hampered by reliance on exposure measures, has also been limited by rather narrow conceptions of public understanding. The tendency to reduce the definition of public understanding of environmental problems to questions of scientific literacy leads to what Ungar (2000) has termed a "knowledge-ignorance paradox." Public understanding may be measured against standards of scientific literacy that few can meet. The media, meanwhile, are faulted for not bringing public understanding up to the desired standard. For example, recent studies of public understanding of climate change have faulted both the media and the public for confusion about the primary causes of global warming (Kempton, 1997).

However, a study using a broader definition found that most respondents had considerable understanding of a number of specific climate change causes, effects, and solutions (Stamm, Clark & Reynolds-Eblacas, 2000).

In this study we propose broadening the definition of public understanding beyond scientific literacy to include what we term "political understanding." We contend that "political realities" are an integral part of solving environmental problems, and that grasping these realities is essential to understanding how and when an environmental problem might be solved. As many authors have explained, the political barriers to solving environmental problems may severely constrain the application of scientific knowledge (Hardin, 1960; Burnham, 1990).

Other researchers have begun to call for a broader conception of public understanding, one that is not so limited to scientific discourses involving physical and biological processes. According to Bulkeley (2000), public confusion concerning these processes should not be interpreted as misunderstanding, rather as a difference in understanding. A crucial component of public understanding, she says, involves how solutions and actions are seen as being controlled by a system of government and industry over which the public has little control.

The public's understanding of political realities may be more closely related to their willingness to become involved and take action than their level of scientific understanding. This has been hinted at previously in the phenomenon of "well-informed futility," in which increased understanding of political and economic impacts is seemingly associated with less willingness to take action against environmental problems (Novic & Sandman, 1974). The phenomenon is thought to be a result of individuals recognizing adverse impacts on their self-interest, but may also be a result of feeling powerless to deal with political barriers. Hungerford and Volk's review of research on factors affecting environmental behavior provides some support for this view. They note that the belief that one has "the 'power' to use citizenship strategies to help resolve issues" is an important component of willingness to take action (Hungerford and Volk, 1990).

More recent research, however, has revealed significant media effects when employing a broader definition of public understanding that considered causes,

consequences, and solutions to climate change (Stamm, Clark & Reynolds-Eblacas, 2000). Yet even this broader definition of public understanding did not incorporate the kind of political understanding envisioned by Bulkeley (2000). The current study attempts to do this by considering three components of the "political reality" of a regional environmental problem—salmon recovery.

Salmon have declined dramatically throughout much of the Pacific Northwest over the last century. Salmon are currently threatened, endangered or extinct over two-thirds of their former historical breeding ranges in Washington, Oregon, Idaho and California (National Research Council, 1996). The declines are largely due to the cumulative environmental impacts of human activities such as agriculture, mining, forestry, grazing, industry, urbanization, dams, hatcheries, and fishing (Lichatowich, 1999).

Salmon recovery represents an environmental problem almost ideally suited for such a study because of actions anticipated under the Endangered Species Act (ESA) that generated media coverage of political action and controversy. As Lichatowich points out, salmon's extensive migrations "create an ideal situation for obfuscation" (1999). Each party to the problem can easily point the finger at another institution or activity that impacts salmon in another part of its lifecycle or range in an attempt to shift the blame. This allows considerable leeway for differences in public understanding in how the salmon problem might best be solved.

Three components of the political reality of salmon recovery that could be readily identified were:

(1) The various political actors with essential roles in bringing about salmon recovery (e.g., commercial fisherman, electric power utilities, timber companies, etc.);

(2) Political obstacles to salmon recovery (e.g., conflicts between jobs and salmon recovery, inability of interest groups to work together, etc.);

(3) Economic impacts of salmon recovery efforts (e.g., removal of dams, higher power rates, etc.).

Research Objectives

The overall objective of this study is to explore the effects of media on public understanding of the political dimensions of an environmental problem while taking into account the individual variability in processing of media content. Media coverage of the issues surrounding salmon recovery has been substantial in regional newspapers particularly, averaging about 30 stories/month in the State's major daily (Table 1). This makes it likely that most people would be exposed to some coverage of the issue, but the amount of attention and cognition associated with this exposure is likely to be highly variable. It is expected that the effects of exposure on public understanding will be more apparent for those whose information processing goes beyond exposure to attention and cognition.

The following research questions directed our inquiry:

1. What is the distribution of information processing for a regionally important environmental problem such as salmon recovery?
2. What is the level of public understanding of the "political realities" of salmon recovery? How is understanding distributed across the three components identified for this study?
3. What is the effect of media coverage on public understanding when level of information processing is taken into account?
4. To what extent does public understanding depend on the medium from which the information is processed?

Methods

A survey exploring public understanding of salmon recovery was carried out during February 1999 shortly before the listing of several salmon stocks as endangered under the Endangered Species Act. Media coverage of salmon issues was extensive in Northwest media for several months prior to the survey, but doubled for a few months following. Interviews were carried out by upper division students in an "Effects of Mass Communication" course at the University of Washington, after receiving training in interview procedures. Random digit dialing was used to select households followed by

random selection within the household using the "most recent birthday" method. Three callbacks were attempted to each phone number before substituting a new number. Random verification checks were performed for ten percent of the sample.

Of 595 attempted interviews, 358 were completed for a response rate of 60 percent, less than ideal but comparable to most surveys conducted in major urban markets. Demographically, the sample does not differ significantly from census data for the metropolitan area.

A four-item measure of processing behavior was adapted from a "political surveillance" scale originally developed by Reba (1997), and based on Carter's (1990) weakness theorem of mass communication effects. The scale was employed recently in a study of radio's effects on political knowledge (Stamm, Johnson & Martin, 1997). The measure was designed to distinguish four "levels" of processing behavior: (1) not exposed; (2) exposure; (3) exposure with attention; (4) exposure and attention with cognition. (A description of the items is included in the appendix.) Each person's score on the scale was determined by the highest level of processing endorsed—e.g., if item three was the most strongly endorsed a score of "3" was assigned. The coefficient of reproducibility for the scale was .78.

A confirmatory factor analysis was conducted to test the unidimensionality of the three measures of public understanding. The seven items in the "political actors" measures yielded a single factor solution explaining 37.8% of the variance in the items (eigenvalue=2.65). Coefficient of reliability (alpha) for this measure was .75. Respondents were asked to rate the importance (1=not important, to 5=very important) of seven different groups to bringing about salmon recovery—e.g., commercial fisherman, power utilities, timber companies, etc. (See appendix for listing of items.)

The six items in the political obstacles measure split into two factors, the expected political obstacles dimension (eigenvalue=1.94, variance=32.2%), and an "economic obstacles" dimension (eigenvalue=1.14, variance=19.0%) that included two items dealing with costs to taxpayers and conflict between jobs and salmon protection. Respondents were asked to estimate the importance (1=not an obstacle, to 5=major obstacle) of several obstacles to salmon recovery—e.g., costs to taxpayers, lack of public

concern, inability of groups to work together, etc. (See appendix for listing of items.) Splitting the items into two measures resulted is less than optimum reliabilities (political obstacles alpha=.50; economic obstacles alpha=.52), but the separation of political and economic obstacles made sense conceptually. Obviously, future measurement efforts should make use of this distinction. Meanwhile, it was decided that the reliabilities were sufficient for purposes of this initial study of political understanding.

The six items designed to measure political impacts of salmon protection did yield the expected single-factor solution (eigenvalue=3.21, variance=53.5%), and a more optimal level of reliability (alpha=.83). Respondents were asked how much they had heard about several impacts of salmon protection (1=nothing at all, to 5=a great deal)—e.g., shorter fishing seasons, dam removal, endangered species listing, increased power rates, etc. (See appendix for a listing of items.)

Finally, respondents were asked to identify their main source of information about salmon issues, and to provide demographic information about gender, age, education, and income. The main sources of information proved to be television and newspapers, followed by radio, magazines, and family, friends or neighbors. For purposes of some analyses the source variable was combined with the processing measure to be able to separately examine the effects on public understanding of processing information from the two most prevalent sources—television and newspapers.

Results and Discussion

Is the public at best semi-attentive to coverage of environmental problems? Perhaps not as non-attentive as some authors have feared based on our data for the salmon recovery problem. Although about 20 percent reported no exposure to salmon coverage, and another 22 percent paid little attention, the majority paid close attention and gave the coverage some thought (Table 2). Unger (2000) allows that some issues may receive more attention than others, and possibly due to its local and regional salience salmon recovery could be one such issue. Still, there is no reason to think that the "need-to-know" is any stronger for salmon recovery than any number of other environmental problems.

Perhaps then the non-attentiveness can be found among those who get their environmental information from television, and perhaps most people are exposed to environmental coverage through television. This does not appear to be the case either (Table 2). The audience for salmon recovery was about equally divided among television viewers and newspaper readers, and even those using television as their main source were often engaged with the coverage. However, it should also be noted newspaper readers were much more likely to go beyond attention to actively thinking about the salmon recovery problem. It remains to be seen whether this processing difference makes a difference in public understanding.

It is clear from Table 2 that engagement with environmental problems cannot be very aptly described in terms of extremes – it is more variable than that. And this variability can be only partly attributed to difference in the medium of choice. We looked for other possible sources of this variability, ruling out several of the usual demographic suspects. There were no differences in engagement by gender, education, or income. There was some difference between age groups with engagement increasing rather steadily into the 40s and 50s (Table 3). Unsurprisingly, those active in an environmental group were also much more engaged with salmon recovery coverage ($F=12.7$, 1 df, $p<.001$). Those most concerned about salmon decline and those attaching the most importance to recovery were also more engaged ($r=.36$ and .28, respectively).

Understanding of the political realities of salmon recovery, as measured by our scales, was relatively high – particularly for the responsible political actors, and the major obstacles to recovery whether economic or political (Table 4). Understanding of political impacts, such as increases in utility rates, was somewhat lower and more variable. In every case the knowledgeable far outnumbered the ignorant. These findings clearly support Bulkeley's (2000) contention that "political realities" represent a significant component of public understanding of environmental problems. The question that remains is what is the source of such understanding? Specifically, does engagement with media coverage allow us to see more clearly possible contributions from the media?

It is clear from our data that exposure, if it is not attentive and/or thoughtful, is not sufficient to make differences in public understanding. In no case was there a

significant difference in understanding between the "exposed" and "not exposed" groups (Table 5). In every case higher levels of understanding were associated with paying close attention and thinking about the problem. The one exception to this pattern was understanding of economic obstacles to salmon recovery—e.g., costs to taxpayers, and conflicts between jobs and salmon protection. This component of understanding seems closely aligned with the kind of understanding that has been previously observed in connection with "well-informed futility" (Novic & Sandman, 1974) and awareness of personal self-interest (Olien, Tichenor & Donohue, 1989). Consistent with this interpretation, scoring high on this component was unrelated to amount of concern about salmon decline, while scores on the other three components were all positively associated with concern (r coefficients all sig. @ $p<.001$). Understanding of economic obstacles may well be "background knowledge" that is abstracted from experience with a variety of environmental problems.

Because previously cited research has often lamented the apparent absence of a television contribution to public understanding, we performed separate analyses of those who cited television and newspapers as their main source of information about salmon issues. Consistent with previously cited studies of political knowledge, we should find higher levels of understanding among those television users who are more engaged with the coverage. In fact the separate analyses for television (Table 6) and newspaper reliant (Table 7) show very similar patterns to one another, and to the results for the sample as a whole (Table 5). Engagement with television appears to make as much difference in public understanding of political realities as engagement with newspapers.

A more in depth analysis, while substantiating the relationship of television engagement to understanding, also revealed some differences between the two media. Comparing the television and newspaper users found no differences in understanding, except that newspaper users had somewhat more understanding of political impacts ($F=4.18$, $p<.02$). Separate hierarchical regressions were conducted for television and newspaper users, relating engagement with the four understanding measures after controlling for age. The standardized betas for engagement with the political actors measure were comparable (tv=.17, newspaper=.23), while the television beta (.24

compared to .07) was much stronger for political obstacles and the newspaper beta much stronger for political impacts (.40 compared to .21). Thus, it does seem to make a difference which medium people use to engage an environmental problem, but it would be an over-simplification to infer that television plays a lesser role in public understanding. It apparently depends on what dimension of public understanding is being measured—i.e., the difference lies in the kind of effect, not the amount of effect.

Implications

This study has asked whether the findings of limited effects from exposure to media coverage of environmental problems could be due to reasons other than the often cited inadequacies in the coverage. Following the lead of several theorists, we have suggested that these findings could be the result of a limited model of effects in which: (1) the processing behavior of receivers is largely ignored, and (2) the definition of public understanding fails to include what is most relevant to solving environmental problems—e.g., understanding of political realities. We wondered if the findings would be different if the receiver's engagement with media content was taken into account, and different measures of public understanding employed.

The findings from a study of public understanding of salmon recovery seem encouraging. It does make a difference in effects observed to take receiver engagement into account because, as the study found, receiver engagement is highly variable, and evidence of media effects is much stronger for those individuals who are the most attentive and cognitively active. Public understanding of political realities was also quite variable, but for most individuals was fairly high on our four measures. The profile of public understanding does not fit the characterization of an ignorant, confused public, so often reported from other studies.

It would be premature to draw general conclusions from one study of one particular environmental problem, but our findings do serve as a reminder that receiver behavior is important because it makes a difference in media effects. In future research, we would do well to incorporate it more explicitly into our conceptualizations and study designs. It would also appear productive to give more thought to what constitutes

meaningful public understanding from the individual actor's perspective. Surely such consideration would lead to improved measures of public understanding that will prove to be valuable research tools.

Many articles on public understanding of environmental problems end with the question of what can be done to increase the amount and quality of media coverage. We think there is another equally important question. What can be done to increase the individual's engagement with that coverage?

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Table 1
Number of *Seattle Times* Articles with "Salmon" in Headline or Lead, 1998-2000.*

1998		1999		2000	
Month	**No. of articles**	**Month**	**No. of articles**	**Month**	**No. of articles**
January	16	January	27	January	17
February	20	February	26	February	34
March	39	March	61	March	35
April	39	April	48	April	24
May	34	May	51	May	34
June	18	June	34	June	36
July	31	July	24	July	39
August	30	August	48	August	36
September	33	September	34	September	33
October	27	October	41	October	32
November	29	November	27	November	21
December	22	December	17	December	17

* obtained from Lexis-Nexis Academic UNIVerse.

Table 2
Engagement Levels for Overall Samples With Breakdown by Television and Newspaper Reliant.

	Engagement level				
	Not exposed	**Exposed**	**Exp.+attent.**	**Exp.+Att. + Cognition**	**Total**
Sample	**19.2%**	**21.7**	**29.9**	**29.3**	**362**
Television	**24.8**	**27.3**	**31.4**	**16.5**	**121**
Newspaper	**20.7**	**16.2**	**27.0**	**36.0**	**113**
total	**68**	**77**	**106**	**104**	

Table 3
Mean Engagement by Age

	Age category:					
	<28	28-36	37-45	46-59	60+	total
Mean Engagement	2.35	2.52	2.79	2.96	2.84	321
total	62	61	68	69	61	

(F=3.43, 4df, p<.009)

Table 4.
Mean Values of Public Understanding Indexes

Measure	mean	s. dev.	n
Actors responsible for decline	3.74	.73	358
Economic obstacles	3.54	.89	351
Political obstacles	3.84	.70	358
Political impacts of decline	3.09	.99	356

Table 5
Mean Public Understanding by Level of Engagement
(whole sample)

	Level of engagement						
Public understanding measure	Not exposed	Exposed	Expos.+ attent.	Exp.+att. +cog.	F	P<	n
Responsible actors	3.55	3.46	3.91	3.90	9.57	.001	354
Econ. obstacles	3.33	3.64	3.58	3.57	1.65	ns	348
Polit. obstacles	3.69	3.72	3.90	3.96	3.30	.02	354
Polit. impacts	2.63	2.69	3.25	3.52	18.88	.001	354
N=	67	77	106	104			

Table 6
Mean Public Understanding by Level of Engagement
(television reliant)

	Level of engagement:						
Public understanding measure	Not exposed	Exposed	Expos.+ attent.	Exp.+att .+cog.	F	P<	n
Responsible actors	3.70	3.41	3.88	3.96	4.10	.008	121
Econ. obstacles	3.31	3.67	3.66	3.18	1.97	ns	119
Polit. obstacles	3.54	3.55	3.91	4.10	3.83	.01	121
Polit. impacts	2.37	2.65	3.17	3.45	10.17	.001	121
N=	30	33	38	20			

Table 7
Mean Public Understanding by Level of Engagement
(newspaper reliant)

	Level of engagement:						
Public understanding measure	Not exposed	Exposed	Expos.+ attent.	Exp.+att. +cog.	F	P<	n
Responsible actors	3.47	3.46	3.85	3.83	2.84	.04	111
Econ. obstacles	3.30	3.50	3.48	3.56	.43	ns	111
Polit. obstacles	3.80	3.94	3.80	3.95	.49	ns	111
Polit. impacts	2.70	2.79	3.31	3.68	8.18	.001	111
N=	23	18	30	40			

Appendix

1. Engagement scale (Please tell us how accurately each of these statements applies to you).
I don't expose myself to information about salmon issues.
When I'm exposed to information about salmon issues, I pay little attention unless my life is directly affected.
I pay attention to salmon issues to find out if something is being done, or not done, that I should know about.
I pay very close attention to salmon issues and often have questions about the information I'm presented with.

2. Political actors (How important is each of the following groups in bringing about salmon recovery?)
Commercial fishermen (.46)[1]
Electric power utilities (.72)
Environmental groups (.61)
Government (.73)
Native American Nations (.59)
Timber companies (.71)
Northwest residents (.63)

3. Economic obstacles (How much of an obstacle is each of the following to salmon recovery?)
Costs to taxpayers (.78)
Conflicts between jobs and salmon protection (.78)

4. Political obstacles (How much of an obstacle is each of the following to salmon recovery?)
Lack of public knowledge or concern about the topic (.61)
Salmon need a pristine environment (.76)
Conflict between salmon protection and business interests (.49)
Inability of different interest groups to work together (.60)

5. Political impacts (How much have to heard about each of the following concerning salmon recovery?)
Fishing seasons being sharply curtailed (.70)
Commercial fishermen selling their boats (.76)
Dam removal (.79)
Listing of salmon as an endangered species (.73)
Environmentalists blaming salmon decline on excessive logging (.71)
Salmon protection raising power rates (.72)

[1] Values in parentheses are the factor loadings of item.

A Repertoire Approach to Environmental Information Channels[1]

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A Repertoire Approach to Environmental Information Channels

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Abstract

This study supports the hypothesis that individuals use repertoires or groups of overlapping information channels for various purposes. Landowners in three Wisconsin counties were segmented into urbanites, rural nonfarmers, and farmers. We analyzed the frequencies with which these groups used different channels and repertoires of channels for information regarding conservation. For each of the populations, three repertoires emerged, although each included different channel arrays. Also, within each population, demographic and conservation-related predictors of repertoires varied.

A Repertoire Approach to Environmental Information Channels

Little has been done to tie studies of public environmental information channels to the broader sweep of communication behavior theory. Benefits would follow for literature on individuals' information preferences more generally (e.g., Rubin, 1994; Wicks, 2001), on how people process and use information (e.g., Petty and Cacioppo, 1990; Eagly and Chaiken, 1993) and how it may inform or influence them (e.g., Miller and Levine, 1996; Berger, 1997). Likewise, linking environmental information to the wider scope of communication could improve policy and strategies for public understanding of environmental issues, and likely science more generally (e.g. Zimmerman, 1995; Raffensperger and Tickner, 1999; Guttman, 2000).

We here hold to the view of audiences being active in information seeking and selection processes, rather than of audiences being passively acted upon by communication agents. Continuing studies on the gratifications communication serve, for example, has supported a view of people choosing media and/or interpersonal channels that meet their expectations for their serving informational interests and needs (Rosengren, Wenner, and Palmgreen, 1985; Rubin, 1994).

As applied to environmental issues, the underlying hypothesis is that the public uses communication channels, both mediated and interpersonal, as a function of their motivational need for particular information content, the availability of the channels, their expectations of the usefulness of the channels, their comprehension of and attention to the channels, their cost, and their credibility. We also hold that individuals, are more apt to use *repertoires* or groups of overlapping information channels for various purposes (O'Keefe, Boyd, and Brown, 1998),

rather than simplistically relying primarily on any one channel, as previous measures typically suggest (e.g., Byrd, VanDerslice and Peterson, 1997; O'Keefe and Shepard, 1998; Jo and Rodriguez, 1999; Suvedi, Campo and Lapinski, 1999; Williams, Vallei, Brown and Greenberg, 2000).

Demographic and socio-cultural factors may also influence communication patterns. Such factors of interest here include income, education, gender, and age as well as awareness, concern and perceptions of environmental issues among differing public groups. Here we rely on survey research data from three broad publics with often differing environmental concerns: Urban (and near-city suburban) dwellers, rural landowners, and owners of agricultural land. Using this breadth of groups, we attempt to build a more complete picture of environmental communication channels, including comparisons among the use of public (e.g., Extension and other governmental agencies), private (e.g., commercial dealer) information channels (Wolf, 1998), as well as general mass media and interpersonal channels. Findings eventually will be tied to communication models of information seeking, utility, satisfaction, and impact, particularly in the emerging realm of repertoires and complementary vs. convergent use of communication channels.

Background and Conceptual Justification

The development of information-seeking and processing strategies currently receives major emphasis in communication research and theory more generally (Miller and Levine, 1996; Wicks, 2001), and in science-related communication in particular (e.g., Friedman, Dunwoody, and Rogers, 1999; Blakeslee, 2001). This is in part because of the increased interest in how complex scientific information can best be imparted to the public, whether involving environmental, public health and safety, biotechnological, economic or related issues (e.g.,

Bracht, 1999; Friedman et al., 1999; Sexton, Marcus, Easter, and Burkhardt, 1999; van den Ban and Hawkins, 1996; Dillard and Pfau, in press). It is also a consequence of the technological sophistication of communication systems themselves (e.g., Nellist and Gilbert, 1999).

The uses-gratifications model noted above is having a resurgence for this reason, and here we have chosen to couple it with the repertoire concept (Heeter and Greenberg, 1985; Reagan, 1996). O'Keefe et al. (1998) were successfully able to do so in examining how the public chose channels of information for health problems. They found that people reported learning different amounts of preventive health information from different channels, and a mix in levels of learning across channels. An exploratory factor analysis indicated three clear repertoire groups of particular mediated and interpersonal channels, and hierarchical regression analysis indicated demographic and psycho-socio predictors of use of those repertoires. Repertoire distinctions were also found among non-farming agricultural opinion leaders, e.g. Extension agents, supply dealers, lenders, etc. (O'Keefe et al., 1997).

These repertoires are often individually tailored, and based on availability, awareness of options, access ease, and awareness of alternatives. When audiences seek content on a specific issue, some seek a broader band of channels than do others (Heeter and Greenberg, 1985). Creating interest or involvement has also been found to lead to more diversity of channels (Reagan, 1996). In sum, we tend to choose a mix of channels to get at the information we think we need and some of these may converge with one another while others may complement one another.

O'Keefe et al. (1998) incorporated a previous concept of complementary vs. convergent information channels (Chaffee, 1986). *Convergent* channels provide the same or overlapping messages, hence potential reinforcement or elaboration for the audience; *complementary*

channels provide information in one channel that is not available in another. Hence a "mixing and matching" of channels or channels provides another rationale for the communication repertoires of individuals. We also distinguish between information *sources*, or the initiator of the content (e.g., a scientist, change agent, etc.) and the information *channel* (medium, neighbor, etc.) by which the audience member received the information. We argue that while there is clear overlap between these two concepts that needs further sorting out, sticking to one or the other -- channels in this case -- considerably clarifies the analytic framework. The research reported here is a still-early step in developing a hybrid blending of these models and concepts into a more coherent framework for examining scientific information seeking and processing, particularly in the environmental realm.

Understanding information-seeking patterns of different groups is especially an issue in public communication programs, notably where environmental issues are concerned, which are fraught with difficulties of conveying multiple, interacting fields of complex -- and often uncertain or contentious -- science, overlapping policy jurisdictions, risky social, political and economic consequences, and so forth (O'Keefe and Shepard, in press).

As for more practical application of the results, agricultural producers in particular are a distinct population subculture with communication patterns and information needs unlike those of others (e.g., O'Keefe and Rursch, 1997; Boone, Meisenbach and Tucker, 2000). Previous work has understated and oversimplified this uniqueness. The situation is further exacerbated in the case of the major issue of agriculture and environmental degradation. Many consider agriculture and related large-scale land practices (ranching, timber) as *the* environmental problem of our times. By comparing agricultural producers with other rural landowners and city

dwellers, we hope to more clearly determine how each of these unique publics uses environmental information channels.

Hypothesis and Research Question

The following operational hypothesis is posed in this preliminary study:

H1. The environmental information channel preferences of each of the three publics identified above will form statistically significant clusters of channels, or repertoires, which will vary among the publics, and by demographic and communication characteristics within each public.

This hypothesis is empirically justified by previous evidence found among the general public on health issues, and among non-farming agricultural opinion leaders. In each case, individual information channels were factor analyzed across respondent samples, and discreet clusters appeared, lumping various mass media and personal information channels. Individual use of these clusters varied significantly by certain demographics, salience of the topic to the respondents, and other factors particular to the samples involved. The hypothesis is also supported by the uses-gratifications model, and by repertoire and convergent-complementary channel rationales, arguing that individuals choose groupings of information channels on the basis of availability, content needs, individual communication mode preferences, credibility, and the ability of the channels in each repertoire to reinforce and/or add to existing knowledge. More specific hypotheses for each public would be preferable, but given the limits of previous rationale and evidence here, we would find them hard to defend.

We also ask the research question:

RQ1. *What convergent and/or complementary patterns can be teased out of the repertoires to help explain why the clusters are grouped as they are (what overlap or lack thereof in content, information characteristics, audience availability, appeal, etc. can be discerned)*?

Methods

The Wisconsin Department of Natural Resources Priority Watershed Program funded in the 1990s, in cooperation with county governments, Extension, and other agencies, dozens of information and education programs (among other assistance) in watersheds deemed at higher risk of degradation. Several of the projects have also funded research efforts assessing citizen knowledge, information needs and channels, attitudes, and behaviors with respect to water quality. The research was aimed primarily at both needs assessment to help in planning of the information and education programs, and as a pilot effort at greater involvement of watershed residents in the research, planning and conduct of the programs (O'Keefe, 1996; O'Keefe and Shepard, 1998; Shepard and O'Keefe, 1999). The research included key informant interviews, focus groups, and telephone probability sample surveys. Data from the most comprehensive of the survey studies carried out will be re-analyzed here, focusing on information channel uses.

The population consisted of adult landowners of three Wisconsin counties; one primarily urban (Marathon), with the two others (Burnett and Polk) primarily rural. The rural county respondents were further divided between farmers and nonfarmers. In Burnett and Polk counties, a census survey of all landowners holding five acres or more was attempted, while in Marathon County, a probability-based digit dial sampling procedure insured as much representativeness as possible. The University of Wisconsin's Wisconsin Survey Research

Laboratory did the sampling, interviewing and basic data processing. The response rate for the Burnett/Polk survey was 76% and the Marathon response rate was 63%. The data from both of these surveys were combined into one data set comprised of 454 respondents.

The residential independent variable, actually a combination of residency and occupation, included three levels: urbanites (n = 178), rural nonfarmers (n = 175), and farmers (n = 101). (Urbanites were Marathon county residents who did not own farm land, nonfarmers were Burnett and/or Polk County residents who did not own farm land, farmers were Burnett and/or Polk County residents who owned farm land. Burnett and Polk Counties are adjacent; some farmland and residences cross the county border.)

The dependent variables were the frequencies of use of information channels for conservation and preventing water pollution. Thirteen survey questions addressed the use of information channels with the following introduction: "Over the past 12 months, how often have you used any of the following sources of information about preventing water pollution and other conservation-related practices? Would you say not at all (1), rarely, sometimes, frequently, or a great deal (5)?" The information channels included were newspapers, local radio, local television, family and friends, magazines, talking with a commercial dealer, reading commercial dealer materials, talking with a county extension agent, reading county extension materials, talking with a county conservation agent, reading county conservation materials, talking with a Department of Natural Resources (DNR) agent, and reading DNR materials. The term "sources" was used in the question since previous experience indicated that "channels" caused confusion for some respondents; while, again, conceptually distinct for our purposes, the term "sources" appears equated with "channels" for the vast majority of respondents.

Analysis

A standardized analytic approach was used on the data set described above, following that validated by O'Keefe et al. (1998) for health information practices. To operationalize the repertoire construct, the individual channel scores were subjected to an exploratory factor analysis using a principal components solution with varimax rotation (SPSS/PC V10.0), with eigenvalues greater than 1.0 as the standard for defining a factor. Hierarchical regression models were used to examine the ability of other variables to predict respondent scoring on each of these repertoires.

First, one-way analyses of variance compared the differences among the means for information channel use and farmer, rural, and urban status. Overall, the most-used channels were newspapers, magazines, and family and friends (Table 1). All thirteen ANOVAs showed significant differences in channel use across farmer, nonfarmer, and urban groups except for newspapers, friends and family, and DNR materials channels.

Follow-up tests evaluated the pairwise differences among the means for those channels that had unequal variances (radio and magazines) as shown by Levene's Test of Equality of Error Variances. Post hoc comparisons using the Dunnett's *C* test showed significant differences between urbanites and the two rural groups for radio use, with urbanites using the radio significantly more for environmental information than did either rural group. The Dunnett's *C* test also showed significant differences between nonfarmer groups and farmers for magazine use, with farmers using magazines significantly more than either nonfarmer group. This is consistent with previous media research on agricultural producers. While pairwise differences were not found for other channels, the trend was for farmers to be the heaviest consumers of environmental information from both government agency and commercial dealers, followed by

rural nonfarmers and lastly by urbanites. This is not surprising, given that such channels typically gear most of their communication efforts at farmers. Urban dwellers, however, tended to turn more to television (and as noted, radio) for conservation information. The pattern clearly suggests more specialized channels sought out by the more water quality and conservation involved – farmers followed by rural dwellers -- with mass media and family and friends either less sought out or about equally so with respect to the other populations.

Table 1 here

The dimensionality of the 13 information channel use items was explored using factor analysis for each of the independent variable groups. Three factors were rotated for each group, using the varimax rotation (SPSS/PC V10.0). The rotated solutions, as shown in Tables 2, 3, and 4, yielded three interpretable factors or repertoires for each group labeled as follows: agency channels, general channels, and commercial channels. The agency channels included those information sources supported by government agencies, including county Extension agents and materials, county conservation agents and materials, and DNR agents and materials. The general channels included newspapers, local radio, local television, friends and family, and magazines. The commercial channels included talking with commercial dealers and reading their materials.

While the same factors indicate the same three repertoires across groups, the amount of variance of the 13 variables accounted for by each factor differed across groups. For example, agency channels accounted for the most variance among the 13 variables for farming, rural, and urban groups (31%, 32%, and 25%, respectively). The loadings on the factors support the ANOVAs in that urban residents appear to rely less on talking with government agents than other groups do. The general mass media-interpersonal repertoire accounted for the second most

variance among the 13 variables for the farming, rural, and urban groups (18%, 18.5%, and 23.6%, respectively). The urbanites in this case again show the most substantial difference in channel use. The commercial channels accounted for the least amount (though still sizable) of variance among the 13 variables for the farming, rural, and urban groups (16.9%, 13.5%, and 14.7%, respectively).

Table 2 here

Table 3 here

Table 4 here

Nine multiple regression analyses were conducted to predict the three factor channel reliance by the farmer, nonfarmer, and urban resident groups (Table 5). The sets of independent variables were ordered. The first set included demographic variables; the sets that followed included pollution awareness and concern variables.

The demographic data included income, education, gender, and age. For the rural nonfarmers, demographics as a set explained a significant amount of general channel use, R^2=.107, $F(4,131)$=3.94, p=.005. While demographics as a set did not significantly predict channel use for the other groups, the data for urbanites indicate that education level had a significant negative relationship with the agency channel; while income level had a significant positive relationship with commercial channel use.

In addition to demographic variables, current awareness, concern, and perceptions also concerning water pollution were used to predict channel use. As a set, the awareness and concern variables accounted for a significant amount of urbanite and rural nonfarmer agency channel and general channel use. The two significant predictor variables within this set were "need for information" and "comparative pollution knowledge." For the urbanites, a sense of a need for information about preventing water pollution significantly predicted general channel use (R^2 change=.194, $F(5,128)=6.329$, $p=.000$); whereas, for rural nonfarmers, the need for information significantly predicted both agency channel and general channel use. In other words, when urban residents think they need more information, they are most likely to turn to mass media and interpersonal channels. Yet, rural nonfarmers, who may have more access to and more confidence in the agency channel than urbanites, are most likely to turn to both agency channels (R^2 change=.216, $F(5,126)=7.46$, $p=.000$) and general channels (R^2 change=.090, $F(5,126)=2.815$, $p=.019$) when they need more information. On the other hand, for farmers, who may have the same access and confidence in agency channels as rural nonfarmers, the need for information only significantly predicts general channel use.

Just as a need for information predicts channel use, a perception of having more knowledge than other county residents also predicts channel use. For both urbanites (R^2 change=.158, $F(5,128)=5.064$, $p=.000$) and rural nonfarmers, the sense of having a superior amount of knowledge about water pollution prevention significantly predicted agency channel use.

Table 5 here

Discussion

Environmental information channel uses of the three populations did differ from one another, and clusters of channels, or repertoires, were found for each of the three groups. While the repertoires were the same for each, the populations varied in their use of them, and within each population different characteristics predicted such uses. As might be expected, the more general, diverse and less conservation-attuned urban public were somewhat more attuned to mass media, while the rural population – especially farmers – relied more on specific and presumably more detailed channels of water quality and conservation information. Importantly, agencies and dealers formed two distinct factors, and farmers were about as apt to turn to dealers for conservation-related information as they were to agency personnel and materials. This adds more evidence of the impact that commercial channels may have on agricultural conservation decisions. Rural dwellers overall indicating a greater need for such information were more likely to turn to general channels than agency ones or dealers.

The repertoires found here were on the one hand more distinct than those for health information among a general population, but demographics and attitudes within the three groups examined did not predict repertoires as well or as consistently (O'Keefe, Boyd, & Brown, 1998). Health information was posed as a quite general content area in the preceding study, while here we deal with a specific water resource and other conservation content. Persons at all involved or concerned with the topic may simply be a less varied population, producing less variance in their communication behaviors, save for differences among urban, rural and farm residents, each of which likely has a need for different kinds of information, and places different value on it. Note that conservation concern within each population was not an effective predictor of repertoires.

In fact, demographics played a quite minor role here, and only self-perceived need for conservation information was a consistent predictor across all three populations. Information need predicted greater use of more general channels such as mass media and family and friends, which one might expect if level of knowledge is low. Indeed, the correlation between information need and knowledge was quite low across the groups, and knowledge was a notably significant predictor of non-farmers getting information from governmentally related agencies, but *not* necessarily from commercial sources.

The exploratory varimax factor analysis technique used here has several limitations. The three factors selected involved reasonable judgment calls based upon our past work and familiarity with the data. Inference-building can be hazardous here as well, but our main purpose was to test the proposition that different publics with different characteristics choose varied mixes of channels depending on their informational needs. That has been demonstrated. With a stronger data set (e.g., fewer single-item measures, a more robust sample size, etc.), more sophisticated techniques of cluster analysis and/or multidimensional scaling could be profitably applied for a more clear image of the repertoires and their predictors.

We have yet to examine such vital aspects of environmental information channels as their credibility (Jo and Rodriguez, 1999; Williams et al., 2000), confidence in them (Byrd et al., 1977), and cost versus utility (Trumbo, 1998). However, we suggest that for most purposes, it is preferable to view each channel as part of a "combo" or repertoire, each channel perhaps playing a certain role for the individual. Some may be cheaper, some may have more credibility, some may yield more information despite greater effort, and so forth. But we choose combinations of channels based upon such attributes, not simply sticking to the "most credible" despite its cost, or the easiest to obtain despite its lack of utility. Rather, the process is more "mix and match,"

likely based upon previous experiences with each medium, or agency, or individual, or specific publication. As was the case with health information, more examination is needed of the convergence and complementarity of these repertoires, both across the total population and within the types of subgroups studied here. The immediate reasons underlying need for information, or interest in it, may lead to quite different information search strategies.

Nor have these data touched upon the highly likely refinements in environmental information channels brought about by the Internet and related channels. Recent evidence suggests that Internet use can affect attitudes toward more conventional channels among farmers, and likely among other individuals (Gloy, Akridge, and Whipker, 1999).

Continuing exploration of communication behavior using the repertoire approach appears valuable, and may grow more so as Internet content in particular enters the mainstream. A true clustering of channels used by individuals in differing circumstances, seeking different gratifications, and with varying channels available to them, whether mass mediated, interpersonal, or electronically personal, would be very useful for policy planners, especially in the complex environmental realm, and in learning about how people make choices about the communication patterns they hope will be most effective.

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Appendix

Survey questions

Income

What was your total household income for the previous year, before taxes? 1 = under 10,000; 2= 10,000 < 20,000, 3= 20,000 < 30,000, 4 = 30,000 < 40,000, 5 = 40,000 < 50,000, 6 = 50,000 < 60,000, 7 = 60,000 < 70,000, 8 = 70,000 < 80,000, 9 = 80,000 or >.

Education

What is the highest grade of school you've completed? 1 = 8th grade or less, 2 = some high school, 3 = high school graduate, 4 = some technical/vocational training, 5 = technical school graduate, 6 = some college, 7 = college graduate, 8 = post grad or professional degree, 00 = other.

Gender

1 = male, 2= female.

Age

In what year were you born? Year was translated to age in 1998, then ages were parsed into categories: 1 = <45, 2 = 46-54, 3 = 55-64, 4 = 65-74, 5 = 75>.

How Poll.

How polluted would you personally say the lakes and steams in your part of [your] county are? Would you say not at all polluted (1), slightly polluted (2), somewhat polluted (3), fairly polluted (4), or very polluted (5)?

Prevent Concern

How concerned would you say you personally are about preventing those lakes and streams from becoming any more polluted than they are now? Would you say not at all concerned (1), slightly

concerned (2), somewhat concerned (3), moderately concerned (4), or very concerned (5)?

Need Info.

How much of a need do you think you have for more information about preventing water pollution? Would you say no need (1), a slight need (2), some need (3), moderate need (4), or a great need (5)?

Knowledge

Compared to most of the other people in you part of the county, how much do you think you know about the best ways to prevent water pollution? Would you say you know a lot less than most other people (1), somewhat less (2), almost as much (3), more than most other people (4), or much more than most other people in you part of the county (5)?

Concern Compare

Do you think most other people in your part of the county are about as concerned as you are about water pollution (2), less concerned (1), or more concerned than you are (3)?

Table 1

Analyses of Variance of Channel Use for Urbanites, Rural Nonfarmers, and Farmers

Channel	Means			*F*	Sig.
	Urban (n=178)	Rural Nonfarmers (n=175)	Farmers (n=101)		
Newspapers	2.5	2.52	2.55	.070	.932
Local Radio	2.19_a	1.81_b	1.86_b	6.624	.001*
Local Television	2.58	1.86	1.72	29.812	.000**
Family/Friends	2.20	2.32	2.29	.599	.550
Magazines	2.13_a	2.16_a	2.60_b	6.233	.002*
Commercial Dealer Talking	1.56	1.64	2.05	9.433	.000**
Commercial Dealer Materials	1.64	1.82	2.20	10.794	.000**
County Extension Talking	1.26	1.51	1.98	23.257	.000**
County Extension Materials	1.61	1.87	2.22	13.107	.000**
County Conservation Talking	1.35	1.60	2.07	22.703	.000**
County Conservation Materials	1.65	1.86	2.24	12.591	.000**
DNR Talking	1.47	1.73	1.89	7.477	.001*
DNR Materials	1.75	1.86	1.98	1.922	.148

Note. Means in the same row that do not share subscripts differ at $p < .05$ in the Dunnett's C test of multiple comparisons.

*$p < .01$, **$p < .001$

Table 2

Factor Analysis of Correlations between Agency, General, and Commercial Channels for Farmers (n= 101)

	Factors		
Channels	Agency	General	Commercial
Newspapers	.124	.625	.336
Local Radio	.001	.646	.354
Local Television	.161	.642	-.102
Family/Friends	.404	.638	.197
Magazines	.185	.516	.554
Commercial Dealer Talking	.397	.199	.775
Commercial Dealer Materials	.297	.125	.859
County Extension Talking	.807	.002	.312
County Extension Materials	.731	.257	.200
County Conservation Talking	.822	.001	.243
County Conservation Materials	.797	.238	.118
DNR Talking	.794	.228	.213
DNR Materials	.657	.498	.005

Table 3

Factor Analysis of Correlations between Agency, General, & Commercial Channels for Rural NonFarmers (n=175)

	Factors		
Channels	Agency	General	Commercial
Newspapers	.250	.580	.121
Local Radio	-.003	.807	.002
Local Television	.002	.801	.001
Family/Friends	.220	.589	.176
Magazines	.400	.514	.113
Commercial Dealer Talking	.200	.105	.890
Commercial Dealer Materials	.153	.153	.894
County Extension Talking	.740	.173	.150
County Extension Materials	.816	.196	.149
County Conservation Talking	.799	.116	.201
County Conservation Materials	.858	.188	.000
DNR Talking	.773	.008	.101
DNR Materials	.845	.006	.125

Table 4

Factor Analysis of Correlations among Agency, General, and Commercial Channels for Urbanites (n=178)

	Factors		
Channels	Agency	General	Commercial
Newspapers	.108	.802	.009
Local Radio	.004	.772	.182
Local Television	.141	.801	.133
Family/Friends	.149	.681	.184
Magazines	.296	.614	.004
Commercial Dealer Talking	.243	.263	.811
Commercial Dealer Materials	.009	.313	.825
County Extension Talking	.493	-.002	.539
County Extension Materials	.733	.174	.149
County Conservation Talking	.700	.002	.357
County Conservation Materials	.754	.233	.132
DNR Talking	.740	.008	.109
DNR Materials	.807	.293	.003

Table 5

Learning about Pollution Prevention from Three Communication Channels

Farmers		**Factor 1**			**Factor 2**			**Factor 3**	
(n=101)	R^2	Adj R .056	Beta	R^2	Adj R .052	Beta	R^2	Adj R -.030	Beta
Demographics	.038	-.011		.024	-.026		.022	-.028	
Income			-.009			-.072			.132
Education			.013			-.066			-.125
Gender			-.045			.243			.157
Age			-.047			.037			.048
Awareness & Concern.	.160			.156			.083		
How poll. (7)			.002			-.133			.042
Prevent concern			.200			.064			-.102
Need Info.			.209			.327**			.202
Knowledge			.096			.059			-.168
Concern compare			-.095			-.089			-.079
R^2 change	.122			.132			.061		

Rural Nonfarmers		**Factor 1**			**Factor 2**			**Factor 3**	
(n=175)	R^2	Adj R .219	Beta	R^2	Adj R .140	Beta	R^2	Adj R .011	Beta
Demographics	.055	.026		.107 (s)	.080		.024	-.006	
Income			.066			-.188*			-.035
Education			.023			.162			.082
Gender			-.111			.083			-.068
Age			-.008			-.183*			.107
Awareness & Concern.	.271			.197			.077		
How poll. (7)			-.026			-.079			-.106
Prevent concern			.011			.089			.045
Need Info.			.181*			.254**			.112
Knowledge			.373***			-.093			-.130
Concern compare			-.117			-.010			-.180
R^2 change	.216 (s)			.090 (s)			.053		

Urbanites		**Factor 1**			**Factor 2**			**Factor 3**	
(n=178)	R^2	Adj R .144	Beta	R^2	Adj R .158	Beta	R^2	Adj R .011	Beta
Demographics	.042	.014		.019	-.011		.035	.005	
Income			.090			-.043			.257*
Education			-.251*			-.007			-.073
Gender			-.029			-.081			.123
Age			.075			.173			-.044
Awareness & Concern.	.201			.213			.076		
How poll. (7)			-.065			-1.04			.069
Prevent concern			-.031			.129			.051
Need Info.			-.049			.339***			-.015
Knowledge			.358***			.121			-.014
Concern compare			-.139			-.085			.202*
R^2 change	.158(s)			.194 (s)			.041		

**** = .001-.0000; ** = .002-.01; * = .02-.05*